# Manchester Tutoring Center

## A Stimulating Learning Environment

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# TABLE OF CONTENTS

# TITLE & SIGNATURE PAGE

## THESIS TITLE

A DESIGN THESIS SUBMITTED TO THE
DEPARTMENT OF ARCHITECTURE AND LANDSCAPE ARCHITECTURE
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BY:

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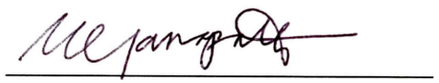
FOR THE DEGREE OF
MASTER OF ARCHITECTURE

PRIMARY THESIS ADVISOR



THESIS COMMITTEE CHAIR

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# LIST OF TABLES & FIGURES





# THESIS ABSTRACT


The focus of this thesis is to analyze space and how it effects the mind in creative processes and learning. Looking specifically at the space's acoustics, natural light, movement, and organization, one can create the ideal learning environment. The typology for this research will be a tutoring facility in the community that will serve the age group of K-8 with the possibility of accommodating other age groups as the need arises.

Socrates said it best “Education is the kindling of a flame, not the filling of a vessel.”(Meyerhoff) When stimulating the brain and its creativity in learning one needs to focus not on how to drive information in, but instead excite and inspire. The premise for this thesis is in focusing on the topic of space and how it can encourage creativity and advance the person in their learning pursuits. In doing this, one must look at different aspects of space such as, acoustics, natural light, spatial organization, the movement through the space, how the student interacts with what is being taught, and other aspects.

The idea for this thesis topic came to me during the summer of 2014. I had started to ponder about what I was interested in studying during my master’s year. While considering my strengths and reflecting on my life, I realized I had a pattern for working with children. I had taught Sunday school for over ten year, and was currently the youth pastor at my church. I had enjoyed reading books on how the mind learns with different teaching styles, and it lead me to thinking about space and how that could stimulate the learning environment. My own high school was poorly designed, made of all concrete, with small and limited windows to outdoor views. Some classrooms had no natural light at all. We were not allowed to paint the walls or add any variation to the building. This was a mistake. School started to feel like prison, instead of the thriving learning environment it could be.

The following spring I spent in Europe, studying abroad. While there I took on a semester project of observing children in the city. Here I was able to see how youth played in urban environments, were creative with different spaces and how they adapted to play in unlikely spaces. A monument court yard could easily become a space to run and play football (soccer) while they dodged people walking by and avoided cars and bicyclists.



Over the summer of 2015, I started my search for a site. I knew I was interested in the New England area on the east coast, but needed to start to look at more specific cities. Boston was my first choice, personally it is one of my favorite cities for its history and location on the water, but it also has a large immigrant population, creating diverse demographics. Then I started to look at New Hampshire cities. Manchester is New Hampshire’s largest city and also had some of the worst crime rate and school testing scores in the state.

While looking at these cities, I studied their demographics, looking at average ages in the neighborhoods, the testing scores of the school systems, their crime rates, ethnic diversity, and local businesses. It was this process that helped me narrow down to three to four sites per city. Then during my visits I was able to select one site per city based on the layout of the site, how it was being used by the city and community and what was surrounding it. Sites that felt unsafe or not well accessible by the community were ruled out for better options.

Over the course of this fall I have selected the final site based off of the direction my research has taken me. I am excited to further my site research of Lafayette Park in Manchester, NH. I have further research to do on the area and site analysis that will continue to help towards my goal of creating a tutoring center that will beneficial to this community.

# NARRATIVE

In addition my research will focus on the different aspects that effect space. I will research and look at case studies that deal with acoustics and the best designs for different spaces and their activities from quiet libraries to music rooms. Looking at how the room is organized with furniture and the movement through it could also either add or hinder to a student's focus. Last, but certainly not least is how natural light affects the space. Are their windows and views to outside? Can the windows open and allow for fresh air. Do the students feel closed off or trapped in small, dim spaces, or can to much open light be distracting. These are all aspects of space that need to be researched and applied to the design.



# PROJECT TYPOLOGY

The project typology that correlates with the research for this thesis is a learning/tutor center that would cater to after school programing and include the community in learning services.

## Fuji Kindergarten
TEZUKA ARCHITECTS

Fugi Kindergarten designed by Tezuka Architects is formed in an oval shape that has an open courtyard in the interior. On the roof they created the playground which is actually very simple. The roof is covered in a wooden deck with trees that grow up threw the building that they have netted in. This creates a soft landing for when the children fall while climbing the tree and it also allows them to see into the classroom below. Along the roof are large boxes for the children to run around and climb on. During recess, you see the children running around the roof in races and relays, climbing the trees, and testing their strength and different abilities (Tezuka).

The classrooms are located below in the body of the oval and are all connected. The large space is divided up by cubbies that are used by the students and teachers. Children are able to wander around from different classrooms and because of the open layout they are always in sight of an adult. Tezuka also talks about how the acoustics of the space are great for learning at this age group. That having some noise calms children, they don't enjoy pure silence like some adults do (Tezuka).

Last, what is great about this design is all the fresh air and natural sunlight the students received on a daily bases. Most of the year, the sliding walls of the school are left open on the inside, and their are sunroofs bringing in more natural light into the spaces. The trees growing through the building also connect the students to the natural environment (Tezuka).



Image 1, Fugi Kindergarden (TEZUKA ARCHITECTS)

Image 2, Fugi Kindergarden Sketch (TEZUKA ARCHITECTS)

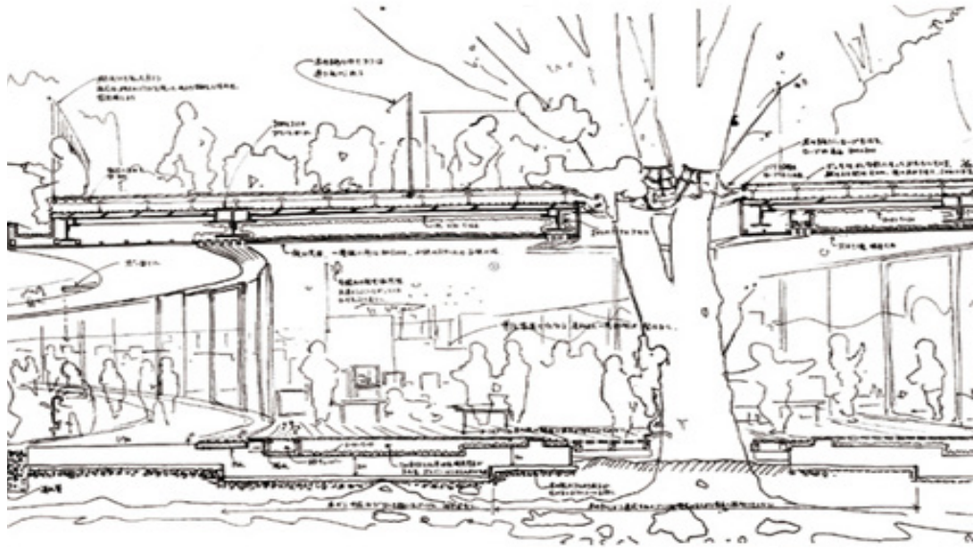


Image 3, Children at Play (TEZUKA ARCHITECTS)

Image 4, Fugi Kindergarden Classroom (TEZUKA ARCHITECTS)



Tezuka's Kindergarten design has many attributes that can be applied to this thesis project.

1. How open, connecting spaces can be great environments to learn in.

2. Bringing nature into the built environment creates natural playgrounds, and tools for learning. Tezuka does this with trees, skylights, an open court yard, and walls that open up during the warmer months to let in fresh air.

3. Having playgrounds that are somewhat difficult teaches children to work together and tests their limits.

4. Having some noise is good for many children, especially those with some social anxieties, like autism. Pure silence can be difficult to work in.

5. Having space to run around and explore lets children learn and play the way they were meant to.

For such a large school in class size, the space works well because the students are given the space they need to move around, and because of clear, open views, teachers can see many areas at once, and work together to teach and take care of the children.

# TYPOLOGICAL RESEARCH

## Case Study 2

826 Valencia is a pirate supply store, writing tutoring center, and publishing house. These things might not seem like they quite fit together, but in this setting, it makes for a perfect after school space. The project started with Dave Eggers, who had heard many times from teachers in his life that students did not received enough one on one time. To solve this in his community he opened his publishing house with a studio for students to come in and receive help with their writing from local professionals. The pirate store was unintentional when they found out the area was zoned for retail (Eggers).

What is great about this design space is the creativity and welcoming environment it provides. After sitting in school all day, students can take a break from the typical motivational quotes and math posters for funny pirate jokes on the walls. They can look through the store and let their creative mind wander. In the studio space, they work on large open tables, where they can discuss ideas with each other and the volunteers. There are no distractions of TVs or videos games, students can work in an environment that is creative and stimulating (Eggers).

This project grew so much that now we are seeing other examples of 826 Valencia popping up all around the United States. In New York City they have the Brooklyn Superhero Supply Co. They sell everything you need to be a superhero and behind a secret door you will find their tutoring center. A room filled with tables, couches, and books. Overhead spot lights and large windows offer comfortable lighting. The wood floors with brick walls give the space a warm environment to work in, verses the plain, cold feel of most school classroom environments (Eggers).



Case Study 2


Image 5, 826 Valencia (826 Valencia)

Image 6, Pirate Shop (826 Stores)


Image 7, 826 Valencia Tutoring Room (826 Valencia)

Image 8, 826 NYC Tutoring Room (Are)





826 Valencia is a unique idea that is spread across America and has many factors that this thesis can learn from.

1. Creating eye catching, welcoming entryways into our learning spaces that excite students to be there.

2. Open spaces that encourage collaboration and an environment that can offer different spaces within.

3. The learning space can have a stimulating environment that sparks creativity in students. This can be done with using a variety of materials to build with, interesting or unique art or objects in the room. Different seating options, they have already spent 8 hours at a school desk, they might enjoy a change.

4. Natural light and the use of spot lights and lamps. Avoid florescent lights since these can cause eye strain.

5. Giving students some control over the space and how things are organized is also a great way to keep them focused, as they will create spaces that best fit their optimal environment.

# TYPOLOGICAL RESEARCH

## Case Study 3

The Ballifield Primary School in Sheffield, UK is a great example of how schools have started to redesign spaces to better fit needs of children. In this project, the architects work with the local architecture school to redesign parts of the primary school. What makes their process so unique, is that they went in and designed with the students. They asked them how they felt in different spaces, worked with them to create models for their playgrounds, and empowered them to make decision about how they learned best (Designing with Children).

The design results derived from this process were wonderful. They designed large open classrooms that could be divided into different sized spaces. Giving flexibility to what the space is used for and the layout of working spaces. They created box bay windows, large enough for students to work in (Dudek). Students commented on how they liked working in a space where they felt like they were hiding (Designing with Children). The large windows could also be opened, giving a connection to the outdoors (Dudek).

The younger students helped redesign their entryway (Designing with Children). They brought in new materials, such at wooden beams that run from the ceiling down the wall. Copper panels will change over time as they patina. And windows and skylights were added to bring in natural light to the hallway. Its an inviting space, that will change with time, just as the students do (Dudek). Later on the architects and school hope to continue there work by taking the ideas on playgrounds and creating outdoor classrooms.

Though they did not redo the whole school or start from scratch, the changes we see being made have improved testing scores and created a better environment for students to learn in (Ballifield Primary School).

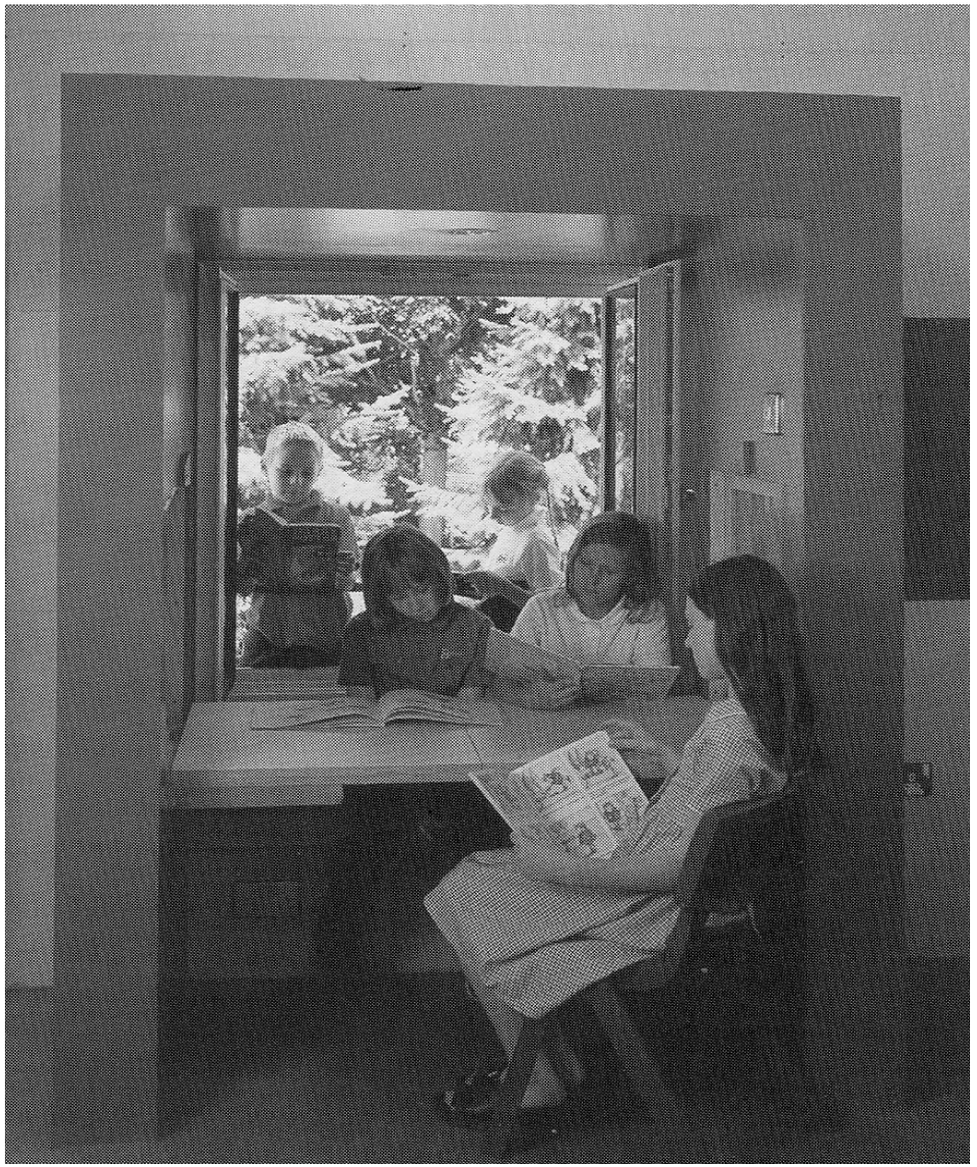


Case Study 3

Image 9, Ballifield Classroom (Dudek)

Image 10, Ballifield Entryway (Dudek)

Image 11, Ballifield Box Bay (Dudek)







Ballifield Primary makes a great example of how changing our environments and creative spaces that offer diversity can help improve learning. Elements that I plan to use for this thesis project are:

1. Creating open classroom that can be divided and organized into different spaces as needed

2. Creating spaces for children to curl up and feel secure, like with the use of the window bays.

3. Creating spaces that connect with the outdoors, large windows, doors that open to outdoor classrooms, vents letting in fresh air.

4. Working with students to design their spaces

5. Selecting a mix of materials that add variety to spaces and create textural elements for the students to feel and look at.

# TYPOLOGICAL RESEARCH

## Case Study 4

Discovery Elementary School in Grand Forks, ND is a brand new school that opened fall of 2015 and was designed by JLG. This school incorporates many of the new features that we see improving school environments in recent years.

**Windows-Daylighting**

• All classrooms have large windows exposing students to natural light.

• The windows on the first floor are also located about 4 feet off the ground to allow for safety if a vehicle were to crash into the school.

• There are interior blinds that allow each room to adjust the amount of sunlight needed throughout the day.

**Acoustics**

• In the open common rooms where many students work at once, the large feature wall is made up of acoustic panels to help minimize the sound levels in rooms

• The teachers have a microphone sound system that links them to any room they are in, to project their voice and minimize voice fatigue.

**Furniture**

• Students have trays that they keep their belongings in so that they are free to move from desk to desk

• The desks are all adjustable and can be set at different heights

•The chairs let students move side to side and backward. They can also sit on the chair forward, sidewards or backwards comfortably.

**Student Spaces**

• The school incorporates spaces for students to mingle and socialize before and after school, like around their feature wall.



Case Study 4

Image 17, Discovery Common Space

Image 18, Discovery Feature Wall

## Case Study 4

Image 19, Discovery Library



Case Study 4

Discovery Elementary School is a great environment for students to learn in and other schools in the district should look to make improvements to this model.

1. Incorporating daylighting into every space
2. Having spaces that connect and flow into each other, like not enclosing the library so that students are encourage to pass through more regularly.
3. Having pods or common areas for each grade so that students can move from the classroom on open area to work on different projects
4. Having private meeting rooms for each common area for small group to meet
5. Having restroom included in each grade pod so that students do not have to go far to use the facilities.
6. Having offices open to main corridors so that facility are easily available to students and parents.
7. Having glass walls so that there is visibility between rooms to promote safety.

# PROJECT ELEMENTS

Classrooms- A open classroom area that creates spaces for large group lectures, small group discussion, and individual work.

Activity Room-Large space dedicated to indoor exercise and games

Specialty rooms- spaces dedicated to music, art, cooking, etc, or to help students who need a particular working environment

Small Kitchen- Kitchen will be used to prepare snacks and to hold possible cooking lessons

Outdoor Space or Park- Large outdoor area designed for students and possibly the community to share. A mix of open grass, gardens, natural playgrounds, water features, and a range of seating options.

Community Space-Places both indoor and out for students and teachers to gather in a casual environment whose purpose is to help stimulate conservations and connection between people.



# CLIENT DESCRIPTION

The project will be designed for the community surrounding Kelley St. in Manchester, NH.

The project will be owed and organized by either local teachers and professionals in the community or the local city. It will be used by its residents on a daily bases.

The number of people using the facility will range depending on the size of the facility and the need within the community.

Included in the group of people could be, students, local community members seeking extra education, people with disabilities, local professionals helping with tutoring, parents, and teachers.

# SITE INFORMATION

## Manchester, NH

Image 12, Lafayette Park

Site Location: Manchester, NH. The site in the existing Lafayette Park, bordering Notre Dame Ave on the west, Catholic Medical Center to the south, Simpson Park to the north.

Site Description: Lafayette Park has a few benches scattered around the site, some located around a light post in the middle of the park. The north part of the park is filled with trees and the south more open. The west side slopes up to the road, and the east side has a privacy wall to block out noise of the nearby road. There are a few walking paths located through the site and one statue on the north side.

Lafayette Park makes for an ideal location because of its close vicinity to Kelley St. The park is underutilized by the neighborhood and could be better developed into a education center and improved park space. The neighborhood has some of the lowest test scores in the state, so they are in need to extra care for their students.



Site Positives:

Demographics: Neighborhood is filled with families, the school has a mix demographic for that area, and the crime is moderate compared to the rest of the city.

Surrounding area: Catholic Hospital provides good jobs for the area, Beautiful Catholic Church across street, near Kelley St (many local businesses)

Traffic: Notre Dame Ave is one way, making traffic light and quiet.

Site Negatives:

Damages: Benches have graffiti on them and do not offer proper support of back. Sidewalks are cracked and need repair.

Lack of attraction: there are no tables, fountains, gardens, or large seating areas in the park

ADA: There are no ramps from Notre Dame Ave into the park, only stairs.

Image 13, Lafayette Park Sketch

# Key

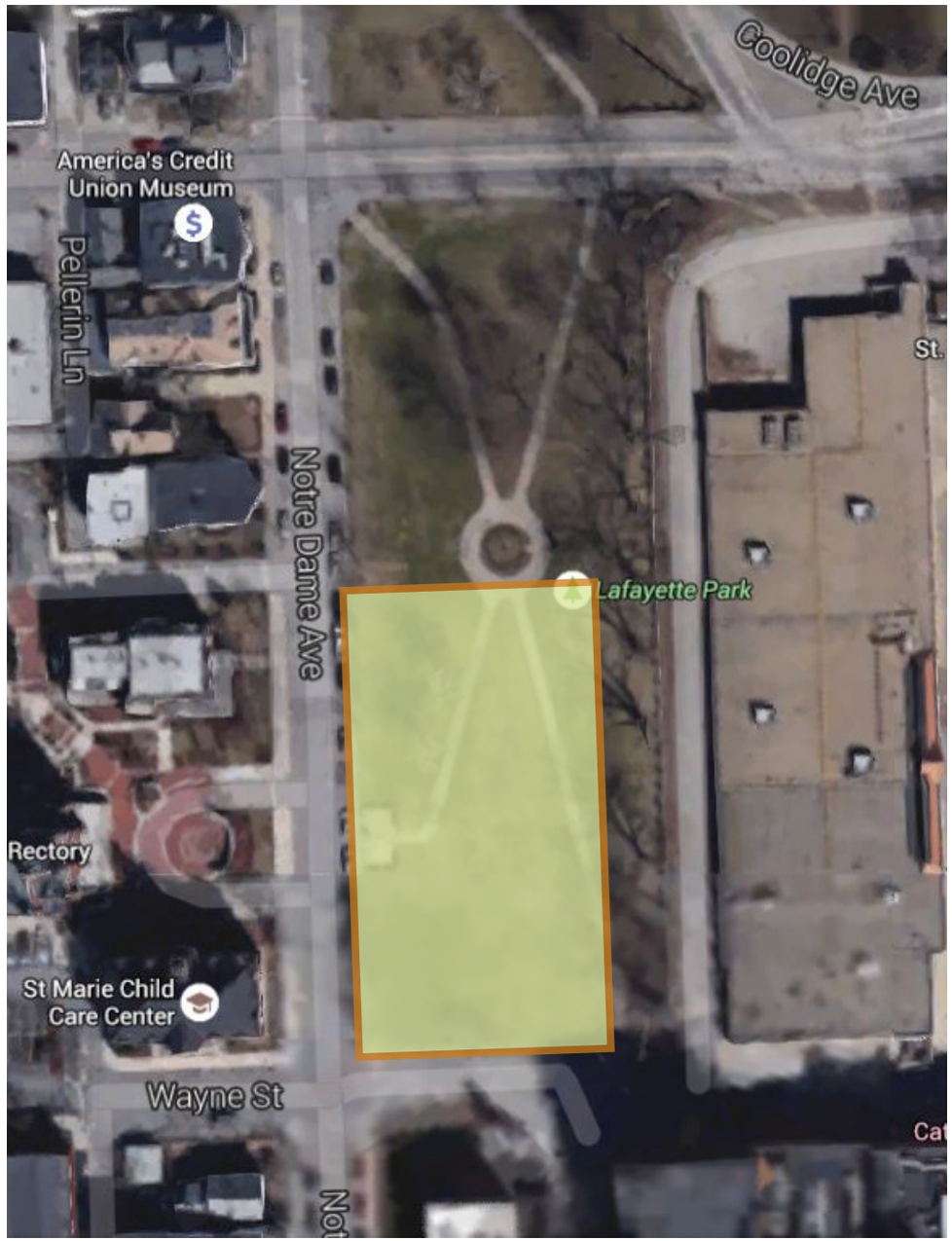
Points of Interest

High Traffic

Image 14, Map with Points of Intersest




Image 15, Site with building outline



# Demographics


Table 1, State Rating Graph
(Schools in Manchester, New Hampshire)

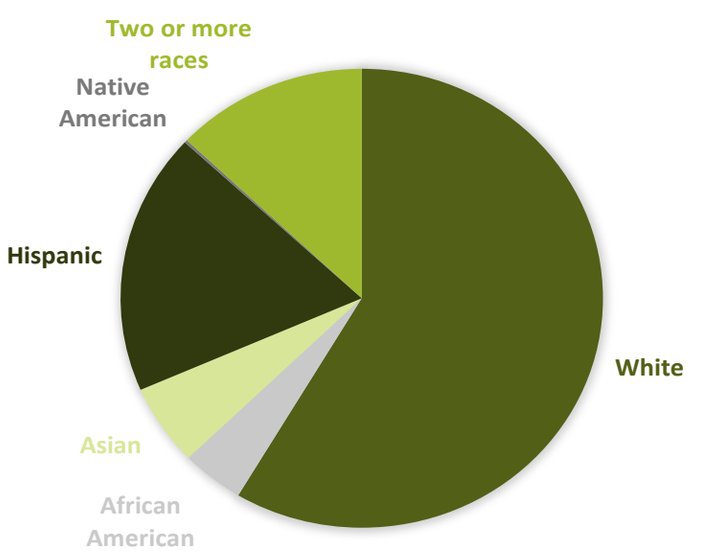



Table 2, Gossler Park School Demographics
(Compare Gossler Park School)



Image 16, Crime Mapping (CrimeMapping.com)

# PROJECT EMPHASIS

There are a few emphasis' to look at in this thesis project.

1. How the organization of the space effects the learning process? How can the furniture layout, size of room, movement in the room, etc, change how the student learns in that environment?

2. How can natural light effect the learner? Can having to much light and outdoor views become a distraction, or can to little create the feeling of being imprisoned, stifling the creative spirit?

3. How can acoustics effect the space? What is the right level to hear the teacher from the front and to also accommodate group discussion within the room? Is the room used to special purposes such as music or drama?

4. How can air flow, quality, and temperature effect the students? Can having cleaner air, in an environment that you are thermally comfortable in help you to focus better and feel better in the space?



# GOALS

1. Academic Goals
My academic goals for this thesis is that my research in space and learning will help to inform my design of a learning center. That I will graduate with a thorough knowledge of the basic of architecture and will be ready to enter the job field.

2. Professional Goals
Professionally, I hope my work on this thesis will open doors for me in work dealing with education. That it will prepare me for moving towards my license.

3. Personal Goals
Personally, I am looking forward to learning more about the learning process. I have enjoyed teaching for the past 10 years, and an interested in advancing my abilities to create spaces that help me in my teaching.

# PLAN FOR PROCEEDING

## Research Direction

My research will focus on the different aspects that affect space. I will research and look at case studies that deal with acoustics and the best designs for different spaces and their activities from quiet libraries to music rooms. Looking at how the room in organized with furniture and the movement through it could also either add or hinder to a student's focus. Last, but certainly not least is how natural light affects the space. Are their windows and views to outside? Can the windows open and allow for free air. Do the students feel closed off or trapped in closed off spaces, or can to much open light be distracting. These are all aspects of space that need to be researched and applied to the design.



## Design Methodology

Methodology for Research

1. Study case studies and previous research done for:
    a. Acoustics
    b. Daylighting
    c. Indoor Air Quality
    d. Spatial Design
2. Create computer models of classrooms that will be used for simulations
3. Run simulations on the models using variety of acoustic, lighting, temperature, spatial movement software
    a. Acoustic use EASE software
    b. Daylight use Revit Daylight Plug in
4. Create graphic charts to represent final results
5. Write Article based upon results

Methodology for Site:
1. Summer Research and Visit
    a. researched sites with low test scores in lower to middle class neighborhoods. This was determined by house value, income, school testing scores, school rankings, and crime rates.
    b. Visited sites in Manchester NH, and Boston MA- narrowed down sites to two locations, one in each city.
2. Determine best site based of Notes
3. Create charts, graphs, and maps to show data information
4. Collect further data of Site
    a. typology
    b. soil data
    c. yearly weather data, solar and wind information
    d. etc.
5. Create analysis maps and charts with explanations of how to makes decisions based off of information gathered

Methodology of Building Program:
1. Identify quantitative information
    a. size of space
    b. hours of operation
    c. number of occupants
    d. type of occupants using space
2. Identify technical information
    a. environment need
    b. materials necessary
    c. support services
    e. air quality



3. Identify qualitative information
    a. light quality
    b. psychologial impact
    c. color
    d. texture
4. Create a list of spaces that must be included in design
    a. spaces should have sq ft estimation
    b. Study how spaces should correlate with one another
5. Establish a budget for the project

Methodology for Design Process:
1. Create mass models and initial sketches
2. Create diagrams for how spaces should correlate
3. Design circulation systems
4. Start fitting design on site
5. Create Structure of building
6. Review education research to apply known design elements
7. Design HVAC and Lighting systems
8. Design final details
9. Create Boards for Presentation
10. Create Models for Presentation
11. Finalize Thesis Book

# Design Process



# Project Schedule

| ID | Task Name | Start | Finish |
|---|---|---|---|
| 1 | IRB training, create questionnaire | Sun 9/27/15 | Sat 10/3/15 |
| 2 | Create school package and submit | Sun 10/4/15 | Sat 10/10/15 |
| 3 | Plan course of action in school, gather supplies | Sun 10/11/15 | Sat 10/17/15 |
| 4 | Make classroom visits | Sun 10/18/15 | Sat 10/24/15 |
| 5 | start simulation models | Sun 10/25/15 | Sat 10/31/15 |
| 6 | simulation models | Sun 11/1/15 | Sat 11/7/15 |
| 7 | correlation conclusions | Sun 11/8/15 | Sat 11/14/15 |
| 8 | write draft article | Sun 11/15/15 | Sat 11/21/15 |
| 9 | create charts from conclusions | Sun 11/22/15 | Sat 11/28/15 |
| 10 | revise draft paper | Sun 11/29/15 | Sat 12/5/15 |
| 11 | Thesis Site Analysis | Sun 12/6/15 | Sat 12/12/15 |
| 12 | Final Thesis Program Due | Sun 12/13/15 | Sat 12/19/15 |
| 13 | Winter Break | Sun 12/20/15 | Sat 1/9/16 |
| 14 | Classes Start- Parti Design | Sun 1/10/16 | Sat 1/16/16 |
| 15 | Mass modeling, Sketches of special organization | Sun 1/17/16 | Sat 1/23/16 |
| 16 | Design Circulation Systems | Sun 1/24/16 | Sat 1/30/16 |
| 17 | Start fitting design into site | Sun 1/31/16 | Sat 2/6/16 |
| 18 | Create Structure | Sun 2/7/16 | Sat 2/13/16 |
| 19 | Review education research to apply | Sun 2/14/16 | Sat 2/20/16 |
| 20 | Design HVAC and Lighting | Sun 2/21/16 | Sat 2/27/16 |
| 21 | Work through LEED | Sun 2/28/16 | Sat 3/5/16 |
| 22 | Design Final Details | Sun 3/6/16 | Sat 3/12/16 |
| 23 | Spring Break | Sun 3/13/16 | Sat 3/19/16 |
| 24 | Create models for presentation | Sun 3/20/16 | Sat 4/2/16 |
| 25 | Create Boards for Presentation | Sun 4/3/16 | Sat 4/9/16 |
| 26 | Final Project Exhibits Due | Sun 4/10/16 | Sat 4/16/16 |
| 27 | Prepare for Presentation | Mon 4/18/16 | Sat 4/23/16 |
| 28 | Thesis Reviews | Mon 4/25/16 | Tue 5/3/16 |
| 29 | Final Thesis Book Due | Sun 5/1/16 | Sat 5/7/16 |

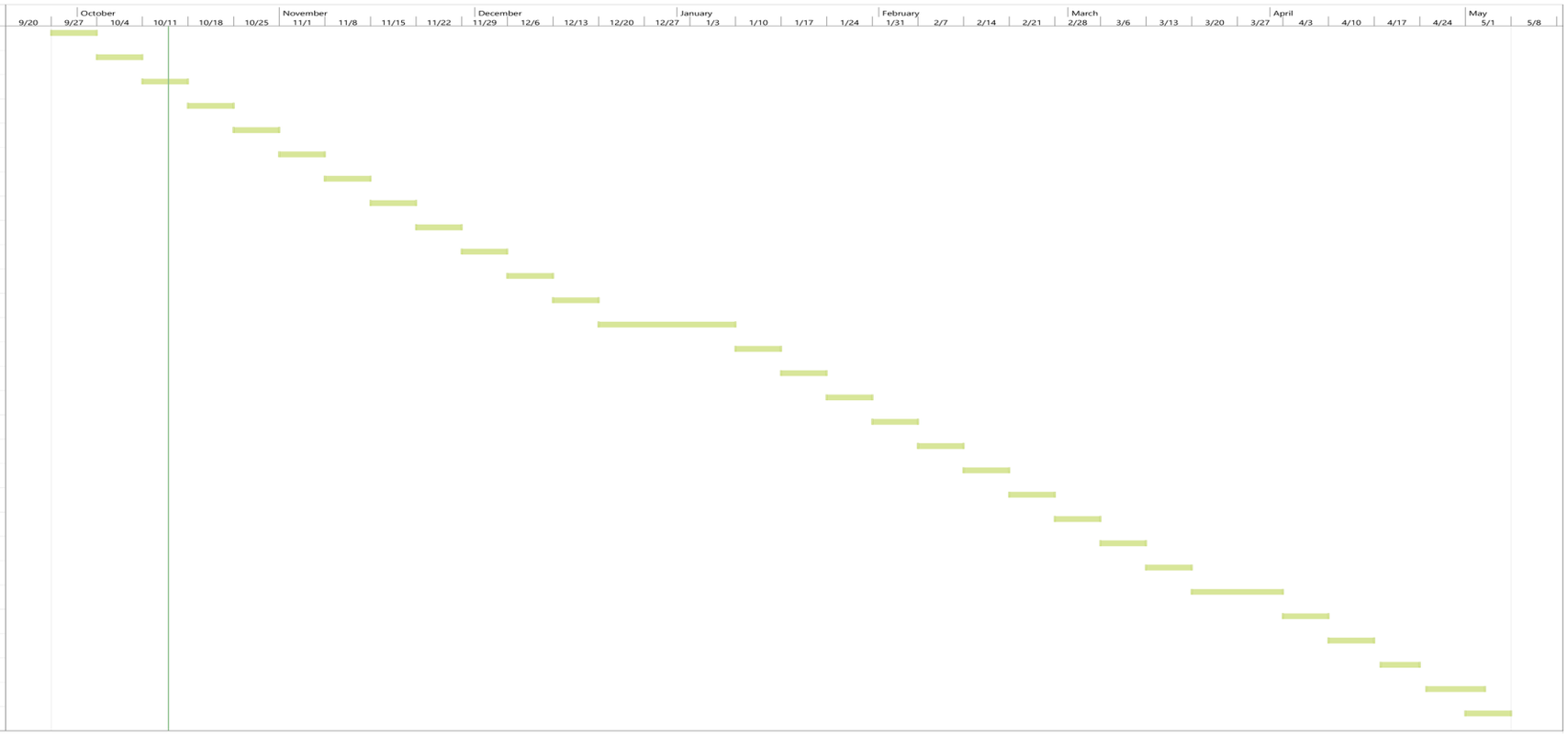



Table 3, 2015-2016 Project Schedule

Creative Process:

a. Sumi painting
b. Model with clay
c. Sketching
d. Modeling with Sketchup

Ideas and Inspiration

a. Books and articles
b. Ted Talks
c. Discussion with mentors and peers
d. Case Studies

Software to Create Design

a. Sketchup
b. Revit
c. Photoshop
d. Excel
e. Indesign
f. EASE software

# THEORETICAL PREMISE

## Literature Review Summary

The focus of my research for thesis was to give myself both a general understanding of education and how children learn and then to look more specifically into the environmental factors that can affect students in a learning space. I have organized this review into the following topics: general, acoustics, daylighting, and indoor air quality. The general resources give overall understanding of the history of education and the learning process. They also include books that cover school design and cover many topics from lighting to ways to improve the classroom environment. The resources of the next three topics give more specific data or research reports on their topics. In doing my general research I found that these three topics; acoustics, daylighting, and air quality had the most research behind them to support improvements in test scores.

The book Disrupting Class gave a great oversight of how education has changed over the years and the different focuses it has had because of social pressures to confirm to the different needs of the culture. It also explained that students have different intelligences which it classify into eight different categories being: linguistic, logical- mathematical, spatial, bodily-kinesthetic, musical, interpersonal, intrapersonal, and naturalist. Understanding that students learn in different ways helps designers to think of spaces that might incorporate these ideas into the spaces.

The next two books, Children's spaces and New Spaces for Learning: Designing college facilities to utilize instructional aids and media give an overview of how to design educational spaces, covering topics such as lighting, lecture hall design, outdoor classrooms, and overall spatial design of schools with detailed tips on how to improve classrooms spaces.

The Acoustical Society of America has publish a couple articles are proved to be very beneficial for designing for acoustics, "Acoustical Barriers to Learning" and "Creation of an architects' companion booklet for ANSI 12.60 American National Classroom Acoustics Standard."



The former, "Creation of an architects' companion booklet" walks you through the science of acoustics and different measuring tools while explaining how to design wall types and other aspects for optimal acoustic conditions. The article also does a great job of justifying why it's important to design for acoustics by highlighting the health benefits associated with it. The other article that the Acoustical Society of America published that is referenced is "Acoustical Barriers to Learning." It gives more of a snap shot of the other articles information, but what is beneficial to this article is that you can more quickly find key facts or benefits that you might be looking for to use with a client. Where the first article gives the full picture to help architects design a space, the second give the summary of the information that is most imperative to convince a client to use these techniques.

The daylighting source specifically references a research study done by Heschong Mahone Group. Their research looks at three school districts located in Orange County, CA, Seattle, WA and Fort Collins, CO. Their research compares classrooms with differing amount of daylight and how it affected the student's learning. They were able to directly link increase amount of sunlight with improved reading and math test scores.

Last, I referenced Greenguard on indoor air quality from their interactive website. Greenguard explains the importance of why we should design schools with indoor air quality in mind. Highlighting the impacts of having poor air quality, the benefits of improving it, and how to design a school to increase the quality of air.

Overall, I found that the sources summarize below gave me both a wide range of information to understand the large picture of the problem I am trying to solve while also giving me the specific information I need in designing my tutoring center and spreading the benefits of why this facility is better suited for students to learn in.

# Literature Review 1

The book Disrupting Class by Christensen, Horn, and Johnson explains the idea of student centric learning and the difference in how students learn. The book makes its argument for student centric learning by walking you through history and the evolution of education in the United States.

The authors classify intelligence in 8 different categories. Linguistic, using language and words to understand and define meanings. Logical- mathematical, having the skill to learn by complex mathematical operations. Spatial, learning using 3d imagery and producing graphic information. Bodily-kinesthetic, learning by manipulating objects and using physical abilities. Musical, having strength in creating pitch, melody, tone, and rhythm. Interpersonal, working well with others and understand them. Intrapersonal, having a clear self-image of oneself and using this in knowledge for planning and directing your life. Naturalist, having strong abilities in understanding nature and patterns within it, this also includes human-made systems. Thinking about learning and intelligence in more specific ways like these helps you to design for different needs, and encourage the behavior that might be natural in that student.

Disrupting Class also takes you through history and how education changed focus because of cultural events happening in the country. It describes the four distinct jobs of education as 1. Preserve / inculcate democracy 2. Provide something for every student 3. Keep United States competitive 4. Eliminate Poverty. In the early years of our country, our leaders wanted to ensure that our new democracy would last and so they opened schools to teach the basics of reading writing and arithmetic to create citizens that would be educated enough to vote and make decisions on their society. In the early 1900s the competition with German industries prompted schools to start training students for vocations to help keep America competitive. The job of preparing students to participate in democracy was still a priority, school were just asked to now train students for both. In the 60s to 80s the United States started to worry that it was losing it competitive status against countries like Japan.



The new focus for schools became keeping the US competitive through state testing and creating high standards for its students. Last, in more recent years, people have started to make connections between education and preventing poverty. With the United States going through a recession, and poverty increasing, schools starting to apply programs such as No Child Left Behind, in hopes that trying to guarantee everyone a thorough education will help to bring people out of poverty and raise the standard of living.

Disrupting Class spends most of the book breaking down technology and how we can restructure classrooms for using technology in a more central innovative manner. Presently, technology is used to supplement our education. Students are given large computer labs, or in some schools each student is given a laptop or tablet for their personal learning use. But what we see if students using them at a minimum. They use them for writing papers and researching, but also many used them for social media and games. The computer has yet to revolutionize how we teach or learn. The book lays out a scenario where students would be able to take all sorts of classes digitally that they might not have the opportunity otherwise. Such as a biology course that incorporates online activities for learning, and lectures where you can watch the professor demonstrate different skills. Though this is not as ideal as a hands on class, for some communities' it might be the only option which would still be better than none.

Overall, Disrupting Class was a beneficial read as it offered background information on the education system, helped identify how students learn, and how technology might become the key to the future our of schooling. Understanding where our education system has come from will help us to reevaluate what is now important to us and how we should proceed with the education of our students. Do we still value what was important to us 20, 50, or over a hundred years ago? What should our purpose be for education now? In addition recently more studies have been happening on how education should be more student focused.

We have to have a balance between keeping our overall goal in mind and treating every student as an individual and not just a number to reaching our standards. The 8 different intelligences that the book highlights does a great job or looking at how we might approach teaching from different perspectives for people with different strengths; the athlete with bodily-kinesthetic intelligence might learn about centrifugal force better on the track field where the student with logical intelligence might learn better through the math equations behind the force. Both will learn about the concept and what it is, but will understand it better through their own strengths. Last, Disrupting Class explains how technology could change education in our country. Where many students are limited in their choices or classes or the styles in which they learn them, with technology we could start to create a diverse array of programs to fit many classes and types of intelligences. Teachers could be freed up from having to lecture all class and would be able to assist students more one or one, which is a constant need we see in education. Though this book does not focus as much on designing spaces as some of the others, I still found it useful as it opened my mind to how space could be better design for technology and how we could design space for the 8 intelligences.

Christensen, C., & Horn, M. (2008). Disrupting class: How disruptive innovation will change the way the world learns. New York: McGraw-Hill.



## Literature Review 2

*New Spaces for Learning: designing college facilities to utilize instructional aids and media,* walks you through how to design different factors of space like acoustic and room design. New Spaces uses a mix of diagrams and drawings to show the best options for design and to explain how spaces and designs work.

Acoustics is broken down into techniques to create optimal spaces. *New Spaces* explains that to achieve a low reverberation rate using porous materials will absorb the sound better. These materials include, carpet, upholstered furniture, and acoustical tiles. Other design elements that can be considered when creating the space is to angle walls towards the lecturer or source of main sound dispersion to help amply to sound through the space.

*New Spaces* also walks you through different scenarios through the use of drawings on how you could design large group classrooms or lecture halls. The drawings explaining the different shape options would be useful if your putting in a theater in the school, or designing for a large school or university.

Overall this book was useful in some aspects but was not ideal for elementary design. With the book being focused on colleges and universities, some of drawings and data were for large group situations and for college campus layouts. But many of the suggestions on acoustics and lighting can be applied to universal classroom situations. The other drawback to this resource was that it was written in the 80s when projectors were still in popular use. Many of the diagrams for the book were on the different layouts and situations that you could have a projector set up and the angle of the light for it to work properly. Though learning about the science and math behind how this works was interesting, it is less valued today when everything is becoming digital. I would suggest reading chapters out of this book, but it would not be valuable to read it cover to cover with today new technology.

Hauf, H. (1961). New spaces for learning: Designing college facilities to utilize instructional aids and media. Troy, N.Y.: [Nold-Miller].

# Literature Review 3

*Children's Spaces* by Mark Dudek focuses mostly on creating spaces for children that they will learn and function in. The book walks you through case studies of schools with optimal layouts to understand how spaces can connect to create environments best suited for children. Then it takes you into the classroom spaces and show different ideas that you could apply to projects to enhance environments. Last it focuses on the outdoor environment, and creating classrooms in nature.

The case study on the school layout focuses in on this idea of pods. Having communal spaces that connect the classrooms so that students have a space to flow from the classrooms and work with each other on projects and activities in a larger space. These pods can also be connected to restrooms, so that each unit has their own facilities to prevent students from wandering around the school. All the pods or communal spaces connect in the books example, so that students can visit other pods without entering into the corridor where elective classrooms or faculty facilities are located. The one aspect of the design that could improve is locating the pods so that all classrooms have views to outside with natural light.

Next the book walks you through some options to improve the classroom space. First it shows options in furniture layout with different drawings. *Children's Spaces* discusses the advantages to different designs from grouped tables, rows, to a U-shape layout. They found the U-shape or horseshoe to be the most effective since it allowed students to work individually, as a small group, or an entire class. Other design suggestions that the author made was to allow flexibility in classrooms by having two rooms connected by a folding screen wall. This way the teachers can decide if they want multiple classrooms to work together on a project or to break the room off into different spaces for separate functions. They also had a case study on a school that had large box bay windows that up to two students could sit in and work quietly while being more connected with natural views. The windows were also operable if the students requested to have a fresh breeze. Having secluded spaces like these is great for students who work better individually or need to have quiet time during the day because of social or anxiety problems.



The book finishes with the advantages to having children learn outside and have hands on activities. They highlighted the need for physical activity in young children and how that helps with concentration because it works the extra energy out of their systems and pushes blood to the brain. *Children's Spaces* gives examples for playground equipment and other factors to consider while designing such spaces to be inclusive to all types' of children and consider the risks in certain activities.

Overall, I found Children's Spaces to be a great resource. I was able to gather many ideas on school and classroom design from the text. Having drawings and many photographs was helpful to see how ideas translated into reality. The book also walks you through a couple case studies like a story when they explain the projects and the design elements to consider. This style of writing was enjoyable because it draws in the readers attention and helps one to think about the client and who the space is designed for. The transfer of information was not detached and cold but a story with characters who you cared about and helped you to connect with why certain techniques are important for learning. My only criticism would be that I wish that for all there helpful suggestions they had statistics on how the students improved in test scores because of the better environments.

Dudek, M. (2005). Children's spaces. Amsterdam: Elsevier.

## Literature Review 4

"Classroom Acoustics for Architects" explains the different of acoustics; background noise, reverberation time, and speech intelligibility. It breaks each of these down and how to design to achieve the best environment for students.

First discussed is background noise and the differing sources from outside environmental noise, schoolyard and maintenance, and inside noise from adjacent spaces (classrooms next door, corridors, restrooms, mechanical rooms, etc.). Next they break down wall design by how much outdoor background noise you might have at your location and the best way to achieve an indoor level of 35dBA. 35dBA is the maximum level you want in a learning environment so that you ensure good speech intelligibility.

The article moves on to explain sound waves and reverberation time. They explain that having hard surfaces in the room will allow the sound to bounce more, blurring the audible sound and lowering the speech intelligibility. Designing using softer surfaces such as an acoustic ceiling, wall panel treatments, and carpeting can decrease the sound from reverberating and increase the speech intelligibility. For spaces less than 10,000 sq ft the maximum reverberation time is 0.6 seconds. The article moves on to say that it is even more important for young children to receive high levels of speech intelligibility because they are not able to fill in the blanks from the words that they miss due to background noise and reverberation.

"Classroom Acoustics for Architects" continues to talk about ways to decrease background noise in your building. One way they point out is by limiting vibration transfer that can be turned into audible sound. They suggest using low-vibration equipment, including resilient pads and springs, and install resilient connections (electrical, fuel, exhaust, etc.) to machinery such as springs, pads, or flex connectors. And the article wraps up there research with more examples on wall construction to use for different sound situations.



In general this source proved to be very useful. They explained all of the science and terms they used in their article so that the reader understood the data. They explained why we should design spaces in this manner and had some explanations for how it benefited students. Mostly it gave examples in the form of charts on how to use different wall types and figures for different spaces in your school and for differing conditions that you might have. My only criticism would be that I wish they had more hard statistics on how these techniques improve learning and test scores.

Woolworth, D., & Phinney, P. (n.d.). Creation of an architects' companion booklet for ANSI 12.60 American National Classroom Acoustics Standard. The Journal of the Acoustical Society of America J. Acoust. Soc. Am., 2046-2046.

# Literature Review 5

"Acoustical Barriers to Learning" looks more specifically at children's speech intelligibility and how different types of children are affected by acoustics.

The article starts with highlighting the problems that schools are facing now in terms of acoustics. They address problems such as the fact that many students in these spaces have disabilities, that students at younger ages have trouble filling in sentences when they don't hear every word spoken, and that teachers should be able to speak in their natural voice without dealing with fatigue and strain. It continues with underlining the points that create spaces with poor listening such as loud noise from vehicles or airplanes outside, noise from HVAC systems in the building, noise from other classrooms, hallways, or large rooms divided with partitions, rooms filled with too many hard surfaces for sound to bounce off of, and noise or the hum that comes from computers and other similar machines.

The article continues on to summarize information taken from "Classroom Acoustics for Architects" since they were published by the same organization. It states that classrooms should focus on having background noise that is no greater than 35dBA, with the interior voice levels being 15dBA higher. And that the maximum reverberation time should be 0.6 seconds. "Acoustical Barriers to Learning" continues by arguing that acoustics is important since many young children have hearing problems, or ear infections that cause hearing loss for months after the infection. In additioin, for many children, English is their second language and they require better speech intelligibility to understand. Other students have attention disorders and can easily be distracted by other noises in the room that pull their focus away from their teacher.

The article moves into a case study that explains how they tested different age groups and found that younger children require a higher signal to noise ratio compared to adults. An adult can understand content at an audibility level of 0.2 where a child need a level of 0.8. "Acoustical Barriers to Learning" also explained that unlike adults, children struggle to block out excess noise as irrelevant and that their brain will read it as an independent sound that needs their attention.



Last, "Acoustical Barriers to Learning" explains the struggles of students with hearing problems such as ear infections and that children learning English as a second language in more detail. It supported its earlier point by pointing out that 20% of students in America speak another language at home and that from studies shown to have poorer SNR (signal to noise ratio) numbers and require the highest levels of speech intelligibility to be able to understand content. Last they look at hearing loss. Many children suffer from ear infections that can last up to a month and about half go untreated. It is likely that children every week are suffering from this and are probably unaware to ask for extra help. Creating an atmosphere that has optimal acoustic levels with help with all types of students dealing with different needs.

This article was a great resource even though it does not go into as much detail as "Classroom Acoustics for Architects." Its strength lives in its ability to summarize the information into an easily read article with many graphs that make the information easy to digest. I found that reading both articles together gave me the best understanding for acoustics and how to relate it to others and apply it to my own work.

Nelson, P., & Soli, S. (2000). Acoustical Barriers to Learning. Language Speech and Hearing Services in Schools Lang Speech Hear Serv Sch, 356-356. Retrieved December 4, 2015.

# Literature Review 6

"Daylighting in Schools" is a research study that was performed by Heschong Mahone Group. Most of their research focuses in Capistrano Unified School District in Orange County, CA, with some additional research done in Seattle and Fort Collins. Their research compares classrooms with differing amount of daylight and how it affected the student's learning.

The article starts by giving the background of their research methodology and what they specifically wanted to analysis and how they would do that. They picked three locations in hopes that at least one location would be able to show some results in daylighting effecting learning, and if all three did, then they hoped that the information would result in similar results. They compared the differences in ethnicity, income, and school district location as well. The different schools offered a range of school styles with differing daylighting amounts. They decided after studying each site to focus the most on the CA site since it offered the widest range of daylighting treatments including many skylights.

Their research in terms of skylights gave some interesting results as they found that not all of them were beneficial. Students located in classrooms with skylights that diffuse the light evening in the space were shown to progress 2 points higher in reading and 2.3 points higher in math than classroom without skylights. Whereas skylight B was not a recommended choice since it was made with clear acrylic and causes glare from light that reflects off of the wall. Skylight A was also successful because it gave control to the teacher to alter the amount of light in the room with the use of louvers. Skylight B did not have any controls with it, so the teacher is left with no way to diffuse or alter the light coming in. They also found that classroom with maximum amount of lighting, which they identified with the use of a photograph to compare maximum windows to minimum increased tests scores by 15% in math and 23% in reading. They also found that having operable windows increased scores by 7% in math and 8% in reading.



They article ends by discussing other benefits of daylighting. Some benefits that it mentions are how daylight illuminates surfaces evenly in rooms, compared to typical lighting which focuses on horizontal features. The article makes the point that in classrooms you want light casting on the faces of people and the wall for the extra resources they provide and not just downward on desks. Colors also appear more natural to the eye in daylighting and being exposed to the Vitamin D is healthy for the body and in recent years has helped treat seasonal affective disorder which is common condition where people become more depressed in the winter months from lack of sunlight exposure.

Overall, I found this research to be very helpful in proving the belief that daylighting does help learning and should be a serious factor when designing schools. The research was written well and included helping charts for their data. My main disappointment with the study is the fact that they did not include specific window to wall percentages. They used words such as minimum and maximum and only included two photos as the example for each. As a designer it would be easier to have a percentage to work towards when designing spaces so that future schools can achieve the best results.

Daylighting in Schools: An investigation into the relationship between day lighting and human performance. (1999). Retrieved December 1, 2015.

# Literature Review 7

"Tips for Healthier Air in Your School" is an interactive website created by Greenguard that easily explains important information about why we should design schools with indoor air quality in mind. It takes you through the impacts of having poor air quality, the benefits of improving it, and how to design a school to increase the quality of air.

First, poor air quality is linked to allergy attacks, headaches, nausea, fatigue, and asthma. According to the US E.P.A about half of schools in America have problems with poor air quality. High levels of VOC (volatile organic compounds) have been linked to trigger headaches, allergy attacks, and asthma. Asthma has become such a problem with children that is causes 14 million missed school days a year. Greenguard does an excellent job of highlighting how important air quality is to keeping children healthy.

There are varying techniques to improve our schools air quality from HVAC systems to what chemicals we use. Some techniques that are highlighted by Greenguard are confirming that your intake air is not located near any pollutants such as vehicle exhaust or the exhaust from the building's exhaust fans. Confirming that the filters in your HVAC systems have a MERV rating of 8 or higher and that they are changed regularly. Having carpets at entryways can reduce the amount of dirt brought into the building by 80%. The carpets should range from 18 to 20 feet in length to allow for 6 footsteps. Operable windows allow fresh air in the building and last choosing furnishing and cleaning products that are low in VOC emissions will help improve air quality.

By applying these techniques to the school environment Greenguard saw a 13-14% increase in math and reading test scores. After an elementary school in Oregon improved their indoor air quality they had a 15% decrease in absenteeism. They found that by improving school environments with sustainability like quality air increase teacher retention by 54% and a 20% improvement was seen in attracting new teachers. Greenguard also quotes a paper by Gregory Kats that states that by improving air quality through an increase in outdoor air ventilation, moisture control, and low VOC emissions they saw up to an 85% improvement in student health.



This interactive website was easy to use and quickly relayed information on air quality that is useful to designers. The visuals of walking through the school with the information attached to relating items triggers understand and helps improve memory of the information. The only criticism is I wish they would have ended the interactive component to a linked PDF with the information written in essay form.

Tips for Healthier Air in Your School. (n.d.). Retrieved December 13, 2015, from http://greenguard.org/en/HealthierSchools/SchoolIAQ.aspx

# PROJECT JUSTIFICATION



Education and teaching has been an interest and passion in my life since I was in middle school and started to teach Sunday school. During my early college years I worked as a youth pastor where I was in charge of creating lessons plans, leading groups meetings, and planning events. The longer I taught the more interested I became in how children learn and techniques to help them focus in the classroom. This position is what lead me to choose a thesis project centered on an education center where I would research the environment student's work in and how it can be improved to boost test scores and student wellbeing.

As I began my research I found I was not alone in my dream to create a better learning environment. Others in the design, teaching, and medical field had started to conduct research on this topic and apply different aspects to schools. With America and much of the world being in an education crisis it is important to study and improve as many areas as possible. As designers it is our responsibility to improve the living environment. While others are more trained to revise curriculum or teaching practices, we hold the power to set standards as to what the design of school environments should be.

For a final project there is an array of research from acoustics, classroom layouts, daylights, and air quality that can applied to learning environment to improve student's health and focus in the classroom. A school or tutoring center has a variety of spaces that needs to be designed from classrooms, to common spaces, outdoor playgrounds with landscaping, offices, restroom, exercise rooms, and a kitchen. The design needs to take an active part in the community and be placed in a location where it would prove the most worth to its residents, so detailed site analysis and demographics is also needed.

This thesis project is important to me since I attended schools that did not apply these techniques to their buildings and therefore I saw the students suffer. I want something better for future generation and in a fast changing world it is important that we offer the best facilities to our children who will be the next generation.

# HISTORICAL NARRATIVE

Throughout history education has been important in our society. Throughout the years the focus of education has changed from preserving our democracy, to providing topics for every student, then during the cold war we focused on keeping the United States competitive, and now we see education as a way to eliminate poverty. But what we forget sometimes is that education is the act of creating thinkers and problem solvers. The environments that students learn in should not just be a space to hold them for 8 hours a day but a space that stimulates their learning, creativity, and overall wellbeing.

The education crisis that we are in has educations, designers, and others looking for answers in many places. One strategy that is happening is comparing the different types of education throughout the years and the positives that came from each era. In one room schoolhouses we see how students are able to tutor one another at different age levels, all acting at teachers for someone else. In these simpler times students generally walked to school and had time to play outside during the day to allow for fresh air and blood flow to the brain. As schools develop over the years, in the 50s we see the style of wing schools that had gardens and windows providing daylight on both sides of the wings. In the 70s the pods were a popular solution, thought these offered great common spaces for students daylighting was less of a priority. Today, those with a passion for educational spaces are studying these examples and attempting with new research available as well to create hybrid schools.



A great example of what I think exemplifies a hybrid school would be Discovery Elementary School in Grand Forks, ND which was built last year and open this fall, 2015. This school incorporates many of the new features that we see improving school environments in recent years. It incorporates the pod system, with four classrooms wrapping around a common area for students to work in. All classrooms have large windows and views to outside. There are interior blinds that allow each room to adjust the amount of sunlight needed throughout the day. In the common areas, the large feature wall is made up of acoustic panels to help minimize the sound levels in the room. Teachers also have microphone sound system that links them to any room they are in to project their voice and minimize voice fatigue. All the desks are all adjustable and can he set at differing heights with chairs that let students move side to side and backward. They can also sit on the chair forward, sidewards or backwards comfortably.

Education has been a part of our American society from the beginning and with that offers a wide range of knowledge for us to learn from. By studying history and the successes we see throughout the years we will be more able to create environments that incorporate more of the necessary benefits that create healthy, stimulating learning spaces.

Image 20, Discovery Classroom

With the education problems in America and throughout the world today, the design of educational facilities is becoming a topic of more precedent. With the world changing so quickly and new technologies coming out every 6 months, we need to be thinking ahead when it comes to school designs and where careers and the job market will be in 10-40 years when the children today are in the work field. With technology growing and replacing many jobs, we need to reorient our schools to focus on creating adults that don't just learn how to process data but are critical thinkers and learn how to create. We already are seeing computers replace people at air ports for check in, they are driving cars, and many things are online now like banking. With this new age coming, we need to think about how to prepare students for the future job market and what that might look like. Creating learning environments that are more focused on student wellbeing and creativity will encourage students to move into fields that deal with problem solving, working with people, and most importantly come up with original ideas to help solve many of the world issues we face today.

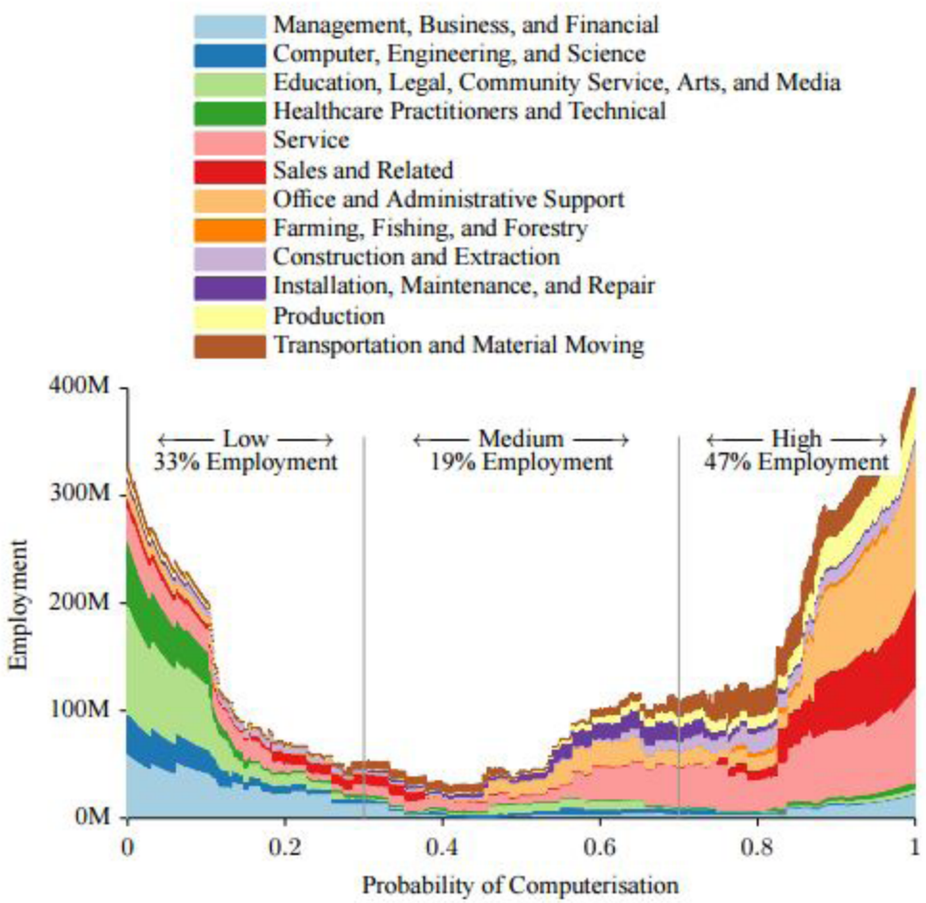
In addition sustainable design is a growing trend in the world as we face energy problems and many of the features that are associated with helping educational space are also sustainable practices. Incorporating daylighting into buildings can be helpful in some locations with heating the building during the cooler months. The use of daylight also cuts down on the need for artificial light, reducing the energy bill monthly. Focuses on landscaping and creating natural outdoor areas for children to exercise and work in will help with flooding problems, and keeping the heat index down by limited the amount of paved area. Making indoor air quality a priority in schools can also encourage the use of fresh air in HVAC systems which can use less energy than some other systems.

The trends throughout America and in other countries are starting to hop on this bandwagon of how important it is to make our school designs a priority. This can only be achieved though if facility, city officials, students, parents, and our government get behind this trend and believe in the effect it can have.



## Vanishing Jobs

Table 4, Vanishing Jobs Graph



My project is set in Manchester, NH. Manchester was chosen because it has some of the worst test scores in the state of New Hampshire and because over the last decade has seen an increase in crime. I wanted to pick a location where building an education facility, in this case a tutoring center, had the chance to make a large impact. In researching the neighborhood and comparing test scores, diversity, and crime rate I found a neighborhood just east of the river that I thought was a good fit. The elementary and middle school located in this neighborhood had some of the lowest in the city and the crime was not as high in this area since it was located farther from downtown. I wanted to help students, but also build my tutoring center in a neighborhood where it would be safe for students to walk from school to this location.

I found a great site, in an underutilized park. I visited the park for a couple hours during the morning and afternoon on a warm sunny summer day and found that no children and almost no local residents used this open space. After a conversation with a local mother who confirmed by belief that the park goes unused, I chose it as my site.

The site is located directly next to a two family housing zone, with Kelley St just one block north with shops and restaurants. South of the site is located a Catholic Hospital and there is a child care facility and church across the street. With the site located on a one way street the traffic is quieter as well and allows for more comfortable pedestrian traffic along the road.

After visiting my site, I walked around downtown Manchester which is located across the river. Though it is seen as having higher crime rate, I found the downtown to be filled with quaint shops and restaurants, and bars and I enjoyed having my lunch and walking around. There is also a University located in downtown Manchester, which gives the city a very young and vibrant feel.



The residents of New Hampshire are wonderful, outdoorsy people. Creating a tutoring center and improving upon the park will be well used by people who love the outdoors. New Hampshire offers a range of outdoor activities from swimming at the beach, going to the lake, hiking in the forest, and skiing down their mountains. In such a wonderful environment, known for their fall foliage, we should celebrate this location by enhancing the park and incorporating a tutoring center to the beautiful views of their trees and the nearby river.

Image 21, Lafayette Park Bordering Street

# SITE ANALYSIS

## Site Analysis Narrative

During my site visit in July of 2015 I had a positive feeling while visiting that influenced me to choose this location for my tutoring center. Originally I was interested in the park across the street, but upon arriving to the location I realized that Layfette Park was a better site because it had a larger area of even ground, was larger, and was situation just north of a hospital where the building systems could tie into. The site was already organized well with trees bordering each side to offer privacy from nearby streets, and the northern half of the site was covered with deciduous trees for amply shade from the hot summer sun. This leaves a great space on the south half of the site for the tutoring center, and the driveway can be tied into the hospitals back ramp.

Besides the hospital and smaller park bordering the north and south of my site, to the west there are older houses made of brick and vinyl siding. Though the homes are older they have been well maintained. The east side of my site drops off down a slope and has a warehouse looking building located on it. But the east side is bordered by an iron fence and trees to prevent children from wandering into unsafe places. The surroundings of this site give it a safe and warm feeling.

But sadly the nice neighborhood is not helping this park, since the park itself is in need of repair and design inspiration. The sidewalks are cracked, the benches have graffiti on them, and the only feature located in the park is a lamp post. Besides the trees and grass lawn there is no other plant variety, flowers, gardens, or fountains. The seating is also very limited at Layfette Park with only benches seating two scattered around the park. There are no large benches, tables, or seating areas for groups. If staff from the hospital choose to eat lunch in the park their only option is to sit two by two with their food on their lap. While at the site from 11am to 12:30 I observed one man eat lunch in the park and two women eat in the parking ramp on the edge bordering the park rather than venture into the space.

I observed many people walk by the park, some with pets as well and none of them entered the park or even pass through for a short cut. The park is lacking some sort of feature to draw the neighborhood into the site and bring life into the space.



After designing my tutoring center on the south half of the south, I plan on redesigning the park space to incorporate a playscape for the children of the center and other features such as water features and seating variety to attract other locals into the space. With no other public parks in the park of city, I think a well-designed space would be well used by all ages.

After collecting further site information, I think the aspect that will make designing my building both challenging and exciting with possibility is the slope. The western part of my site sloped down fairly steep at about 15-35%. Currently there are stairs on this part of the site to have users enter it. It will be interesting to see how I will either alter the site or configure my building on this site. But one aspect that will need to be addressed that is not currently is accessibility into the park and site, and possibility the building because of the steep slope. It will be important to either change the slope to a more gradual degree or cut a ramp into the hillside to allow ADA to be incorporated into solution.

## Qualitative Aspects

Light Quality:  The surrounding buildings are not over 4 floors in height, so the site is not shaded much by nearby buildings.  The northern half of the site has tree vegetation on it which offers shading from the sun.  There is a balance of full and partial sunlight here.  With the site located on the northern part of the east coast, the temperature here does become hot and humid in the summer but never unbearable like in some southern parts of the country.  The winters are cold and snowy, so having the sunlight will be a blessing.

Vegetation: The site is filled with trees on the north side, and just a few trees on the slope of the south west side. Beside the trees the site is filled with grass. There is no other vegetation or plant variety on the site.

Water: There are no water features or any natural water connected to this site.  For future design, this is something that might be added to enhance the environment of the site.

Wind: Winds during the site visit were an average of 5mph, with the yearly average for the year past year being 7mph.

Human Characteristics: The space is minimally used.  While visiting the site only one person entered the park from the south side, appearing to be taking their lunch break from the hospital. Others that exited the hospital sat at the end of the park, on the parking lot side, never venturing into the space during their break.  The seating areas in the park are limited to only allow two people at a time to sit, no group spaces, and no tables to work or eat at.  The space is in need of a redeisn to help draw people into it.

Distress: The sidewalks are cracked in some areas and need to be replaced.  There is graffiti on the benches.



## Quantitative Aspects

Utilities: The utilities for this site will be linked into the hospital in the site south of the park.  With a hospital being the nearby site, this gives a variety of different systems to choose from.

Vehicular Traffic: The street to the west is a one way which limits the amount of traffic moving by.  There is a busy street on the east side of the park, but a large brick wall blocks out a fair amount of white noise and creates a barricade to prevent children from running into the street. While visiting this site, I found the site to be quiet and have a safe feeling.

Pedestrian Traffic: The sidewalks and streets nearby have people regularly walking by.  It is a popular spot to walk your dog as well.  But sadly almost no ones enters the park on there walk.  They travel around it on the sidewalks.  The site needs to re-evaluate how to draw people in and create interesting experiences for the users.

Visual Form: The nearby terrain has slopped landscapes with a mix of single family housing and commercial buildings such as the hospital south of the site and the catholic school to the west.  People walk by the site since the street is a one way and lends to quieter safer pedestrian travel, but east of the site there is a high traffic road, but a sloping site, railing, and building, help to secure my site.

Site Character: From my observations there are very few signs of change in the site.  The few are the aging and distress in the benches and sidewalks. The trees and land are in healthy condition.

# Plant Cover

The site in covered half by deciduous trees have them lining the east and west sides.  The south part of the site is covered by cut grass.
With the road slopping down into the site, it is important to have vegetation to help with drainage and prevent flooding on the site.  With the area surrounded by lower buildings, the site receives full sun which offers many options for plant variety on the site.

Image 22, Lafayette Park



# Soil Data

Hillsborough County, New Hampshire, Eastern Part

Soil Type:
Windsor loamy sand
Moderately decomposed plant material

Slope: 15 to 35 percent slopes

“Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. “Loam,” for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is 15 percent or more, an appropriate modifier is added, for example, “gravelly.””

# Water Table

Image 23, Water Data Location

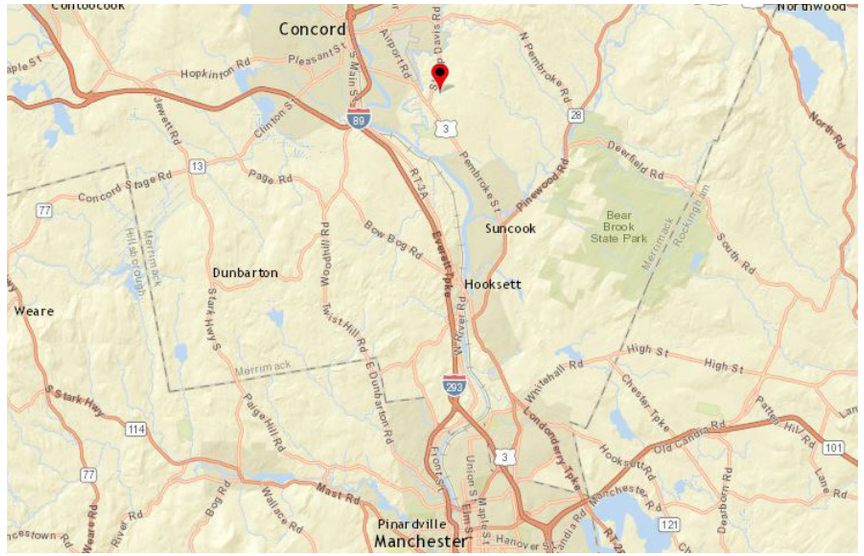
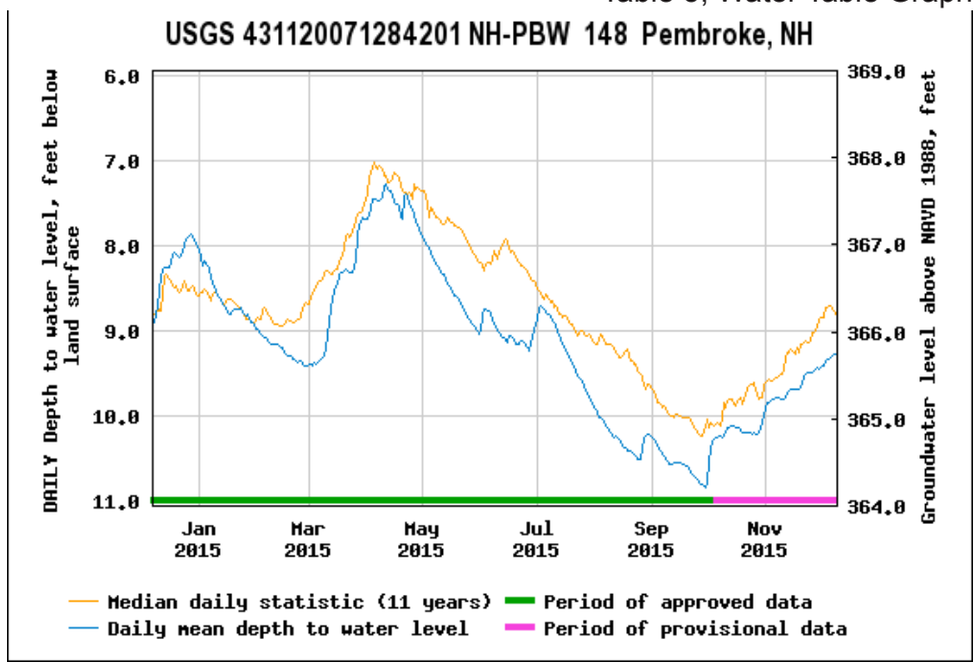



Table 5, Water Table Graph



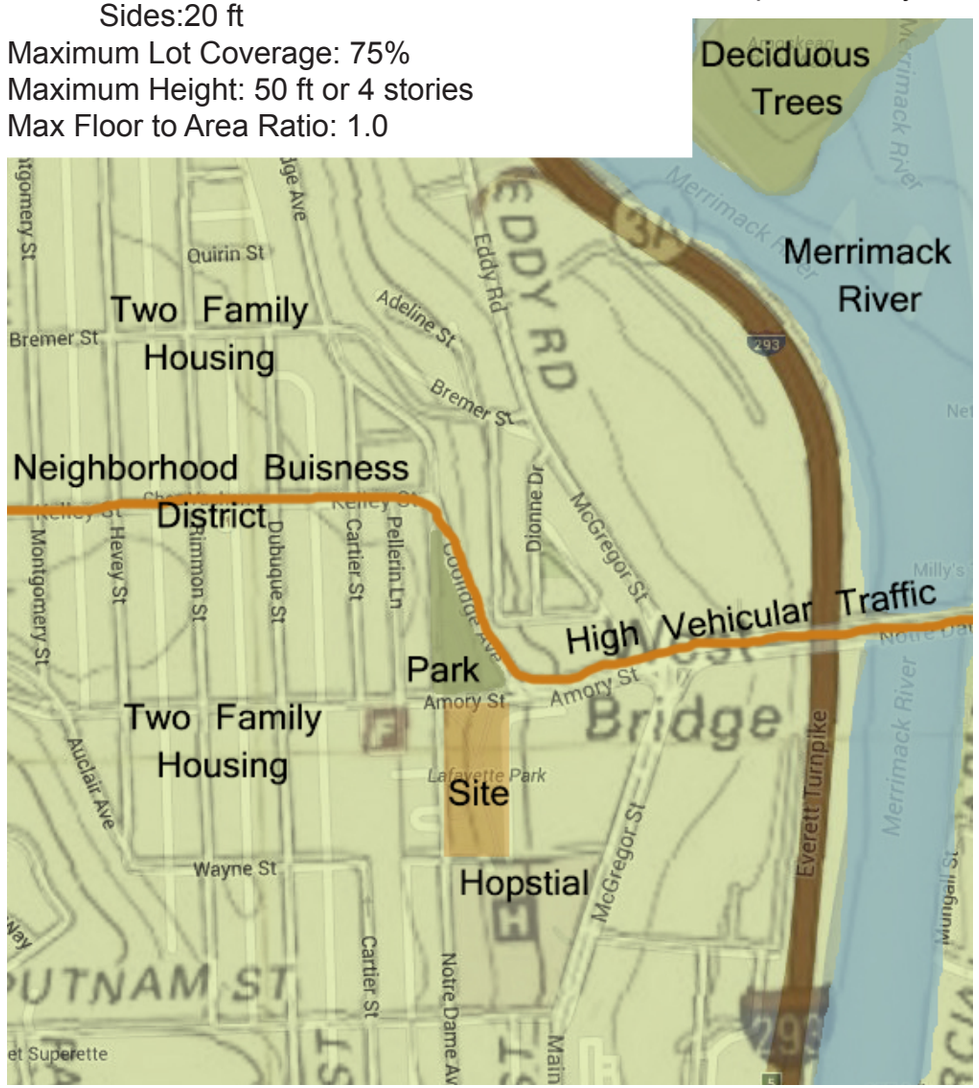



# Base Map

Distrcit Zone- B2, General Business District
Minimal Frontage: 100 ft
Setback:
- Front: 20 ft
- Rear: 30 ft
- Sides:20 ft

Maximum Lot Coverage: 75%
Maximum Height: 50 ft or 4 stories
Max Floor to Area Ratio: 1.0

Image 24,
Map Site Analysis



# Topographic Survey

The slope for my the site is 15 to 35%.

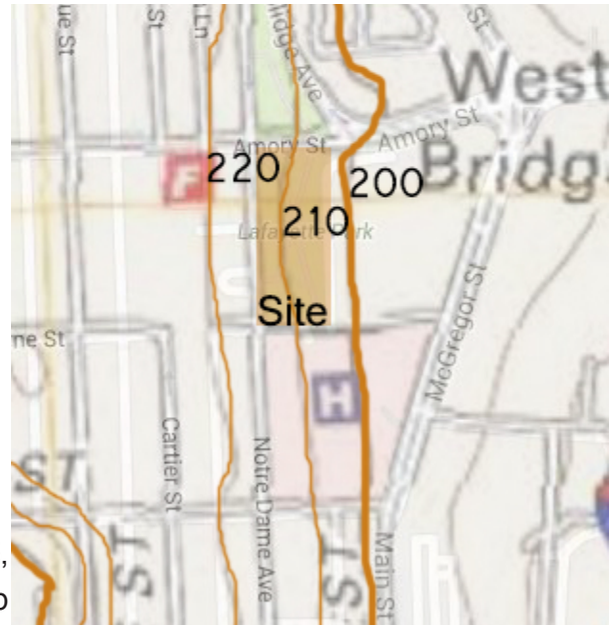
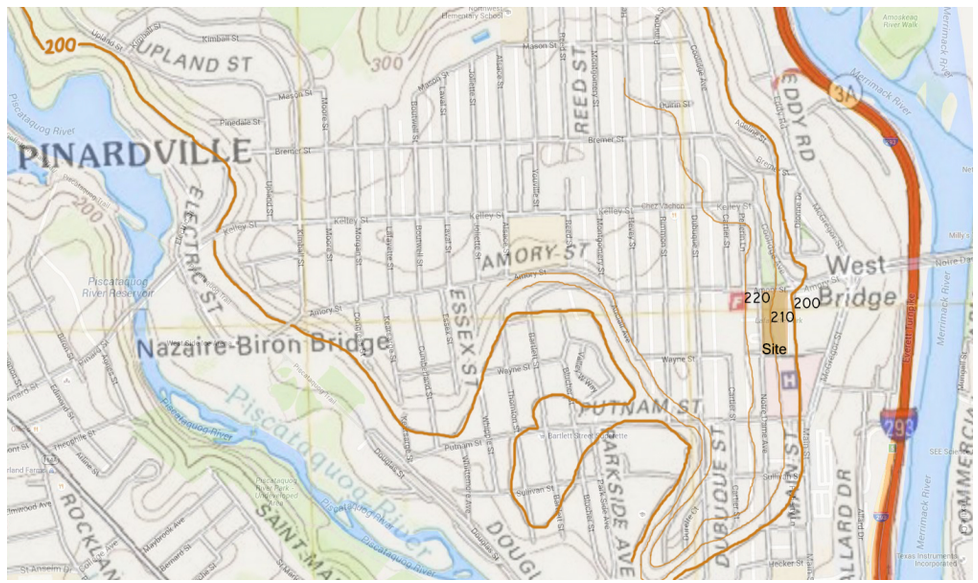



Image 25, Topographic Survey Map

Image 26, Topographic Survey Map






# Street Section Analysis


Image 27, Street Section Analysis

# Climate Data

## Yearly Averages

Temperature
- Low: -9 F
- High: 95 F
- Average: 51 F

Dew Point
- Low: -20 F
- High: 75 F
- Average: 37 F

Precipitation
- High: 2.16 in
- Average: .08 in

Snowdepth
- High: 24.0 in
- Average: 2.3 in

Wind speed
- Wind:
  - Low: 0 mph
  - High: 41 mph
  - Average: 7 mph
- Gust Wind
  - Low: 16 mph
  - High: 53 mph
  - Average: 23 mph

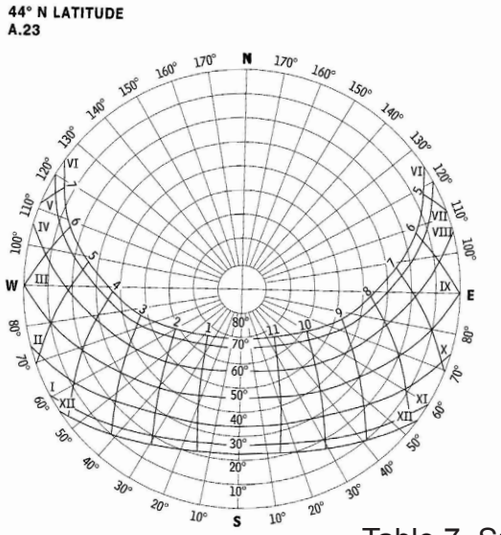



Table 7, Sun Path



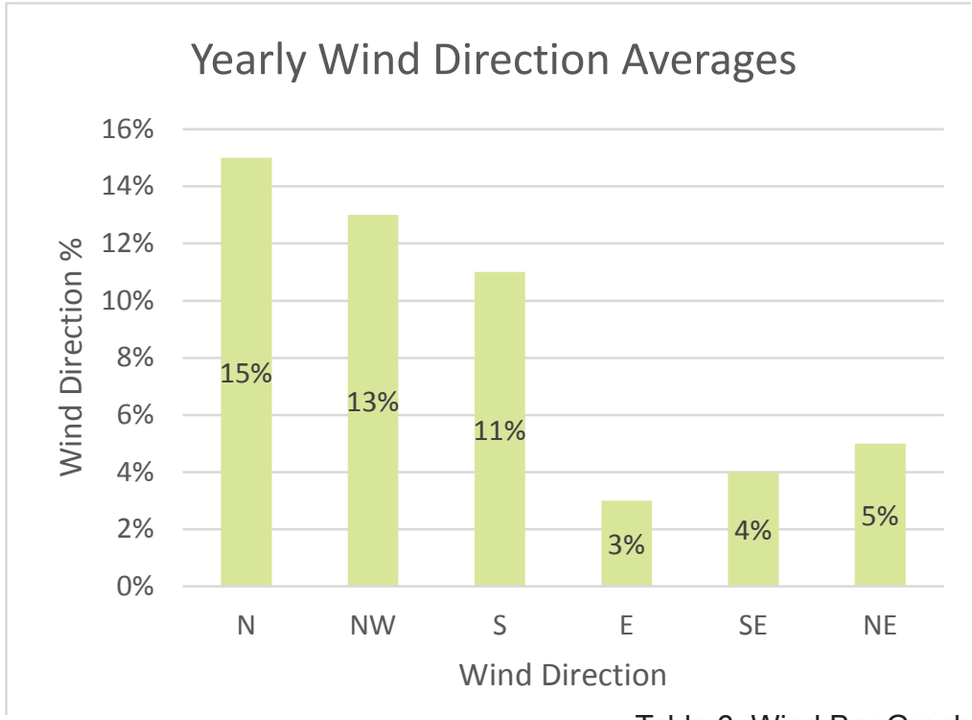



Table 6, Wind Bar Graph

# Site Visit Data

July 2, 2015 11:00 am

Temperature: warm, 70 degrees Fahrenheit

Humidity: average humidity was 65 that day

Precipitation: 0 inches

Cloudiness: Sunny day, very few clouds

Wind speed: 5 mph

Wind direction: WSW

Noise: The site is fairly quiet, even with the busy road next door, the privacy wall on the east side of the site does a good job of blocking out most of the noise.



Image 28, Photogrid

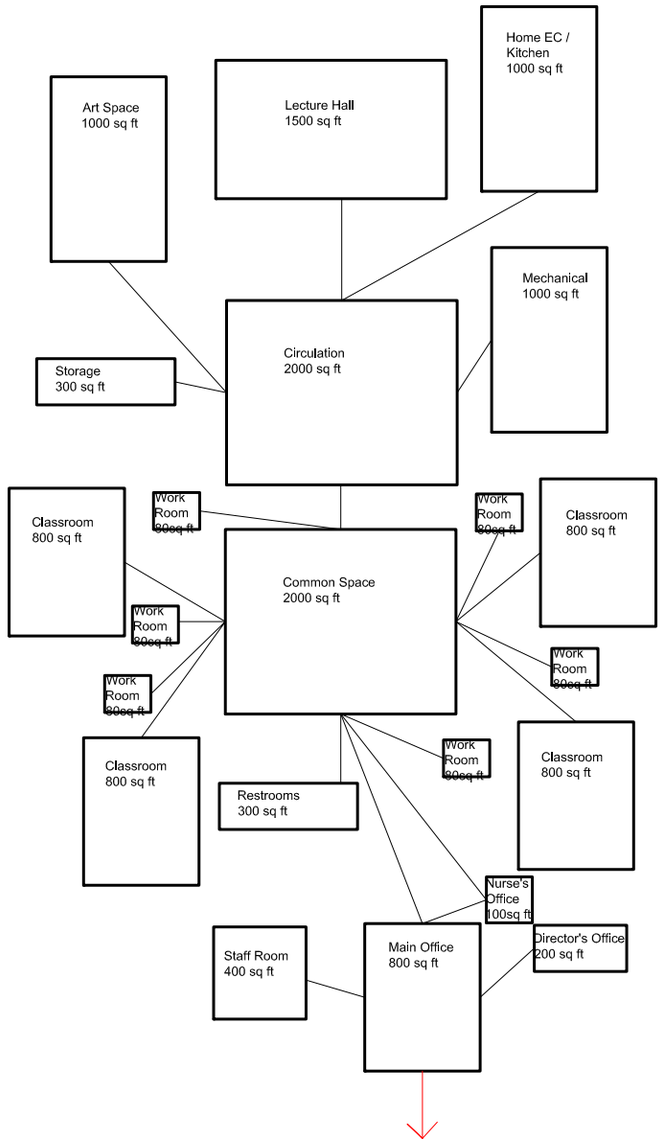
# BUILDING PROGRAM

## Building Program Spaces

| Room | # | Sq Ft | Total Sq Ft | Acoustics | Daylighting |
|---|---|---|---|---|---|
| Classroom | 3 | 800 | 2400 | yes | yes |
| Lecture Hall | 1 | 1500 | 1500 | yes | yes |
| Common Space | 1 | 2000 | 2000 | yes | yes |
| Art Space | 1 | 1000 | 1000 | yes | yes |
| Home Ec | 1 | 1000 | 1000 | yes | yes |
| Main Office | 1 | 800 | 800 | yes | yes |
| Directors Office | 1 | 200 | 200 | yes | yes |
| Staff Room | 1 | 400 | 400 | yes | yes |
| Storage | 1 | 300 | 300 | no | no |
| Work Rooms | 5 | 80 | 400 | yes | yes |
| | | | | | |
| Total | | | 10000 | | |
| | | | | | |
| Mechanical | 1 | 10% | 1000 | yes | no |
| Circulation | 2 | 20% | 2000 | yes | yes |
| Restroom(WC) | m:2 | w:3 | 300 | yes | yes |
| | | | | | |
| Total Building Sq Ft | | | 13300 | | |



## Building Program Diagram



# Building Program Summary

For the building program I thought through the different spaces that would be both necessary and beneficial to the students that would be using my tutoring center. I wanted an array of spaces from classrooms that flow into the common space to private work rooms that students could use for practicing instruments, quietly studying, meeting in small groups, or other activities.

When laying out spaces, special attention should be held to verify that spaces that were earlier specified would include daylighting. It is also important to pay attention to the acoustics needs of rooms and either situate rooms according to sound levels or have amply insulation for those spaces.

To help give purpose to this building beyond just after school tutoring, the center could also be used by individuals who home school if they are looking for a group class during the day or extra space for an activity.



# Projected Building Costs

| Project Costs | | | |
|---|---|---|---|
| Land Acquisition | Land Area | | 100,000 |
| | Land Cost per Sq Ft | $ | 17.61 |
| Demolition Costs | Building Area | | |
| | Demolition Cost per Sq Ft | | |
| Building Construction | Building Area | | 15,000 |
| | Building Cost per Sq Ft | $ | 115.86 |
| Fees & Misc | Fee Rate (%) | | 20% |
| Construction Financing | Construction Interest Rate | | 7% |
| | Construction Length (yrs) | | 1.5 |

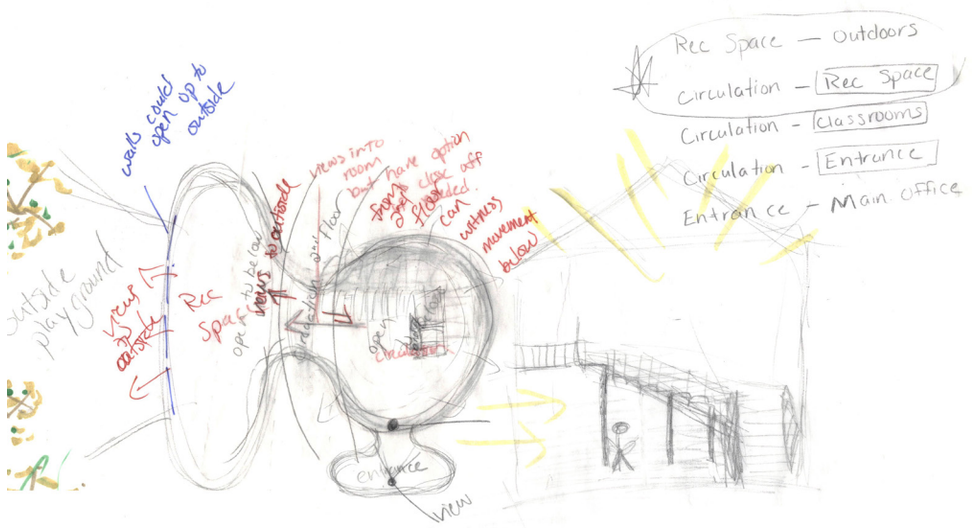
| | | |
|---|---|---|
| Land Acquisition | $ | 1,761,000.00 |
| Demolition Costs | $ | - |
| Building Construction | $ | 1,737,900.00 |
| Fees & Misc | $ | 347,580.00 |
| Construction Financing | $ | 218,975.40 |
| **Total Project Cost** | $ | 4,065,455.40 |

| Long Term Financing | | |
|---|---|---|
| Down Payment (%) | | 10% |
| Mortgage Rate (%) | | 4% |
| Mortgage Length (yrs) | | 30 |

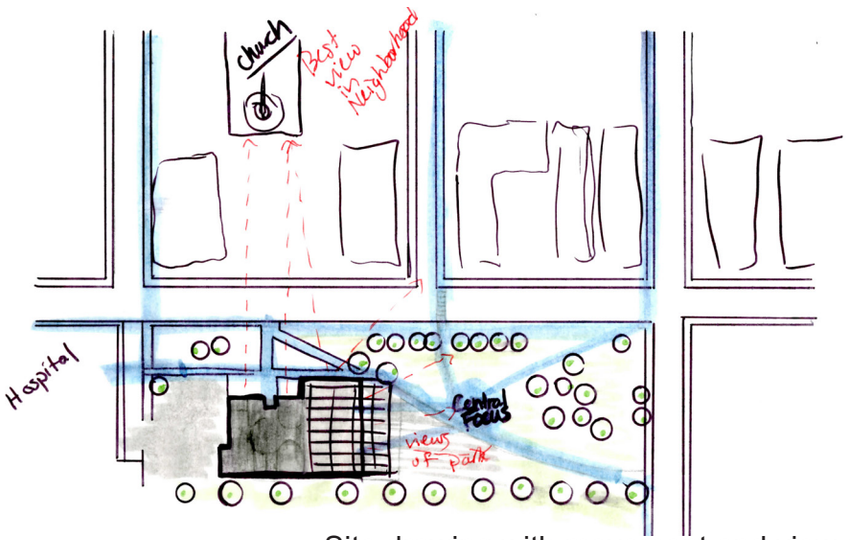
| | | |
|---|---|---|
| Amount to be Financed | $ | 3,658,909.86 |
| Debt Service | $ | 17,632.93 |
| Cost of Financing | $ | 2,282,398.20 |

# PROCESS DOCUMENTATION

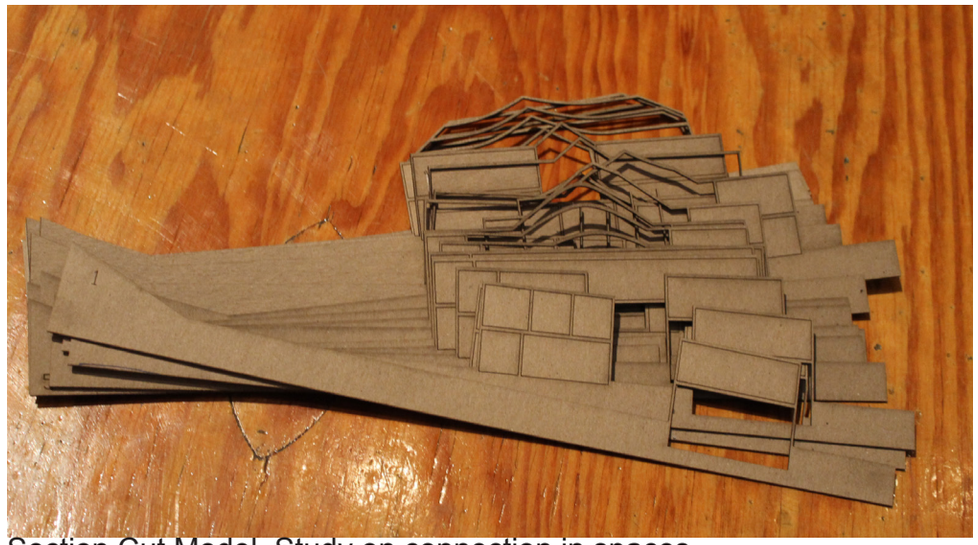




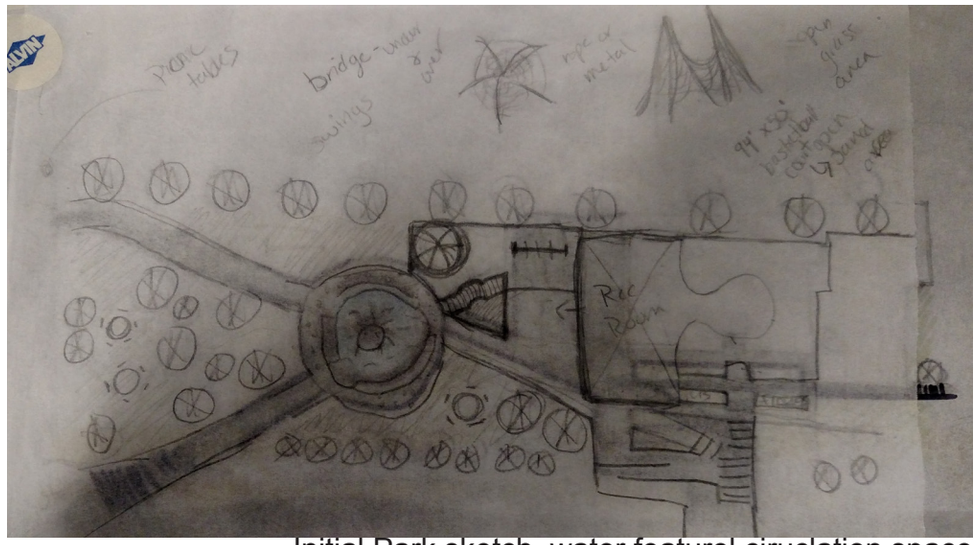

Building Sketch, movement study



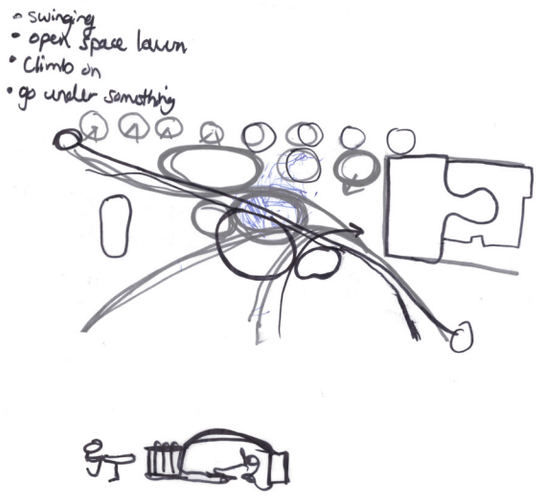

Site drawing with movement and view study



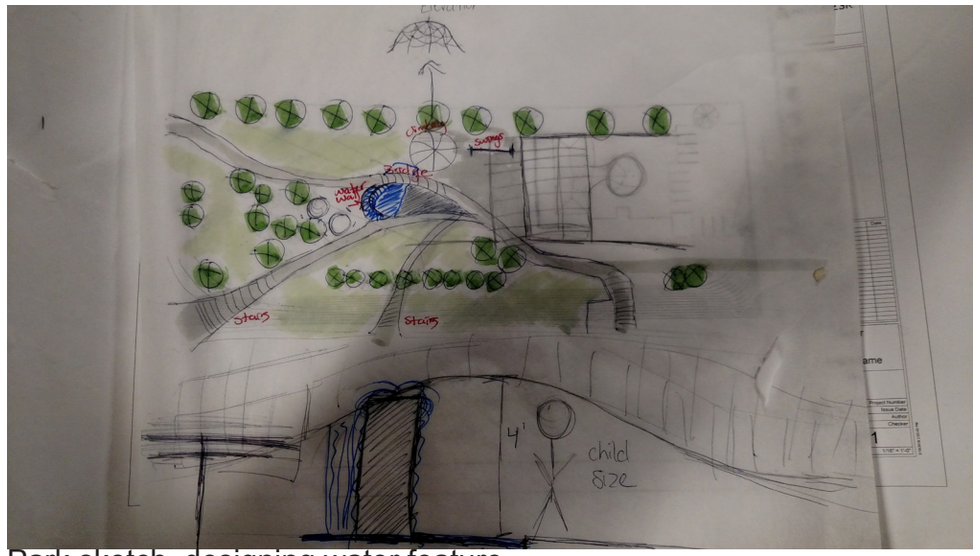
Section Cut Model, Study on connection in spaces




Initial Park sketch, water featurel ciruclation space

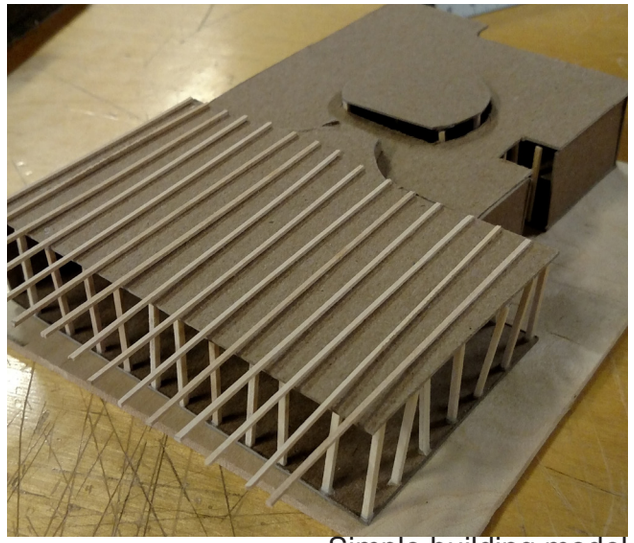



Park sketch, studying movement and layout

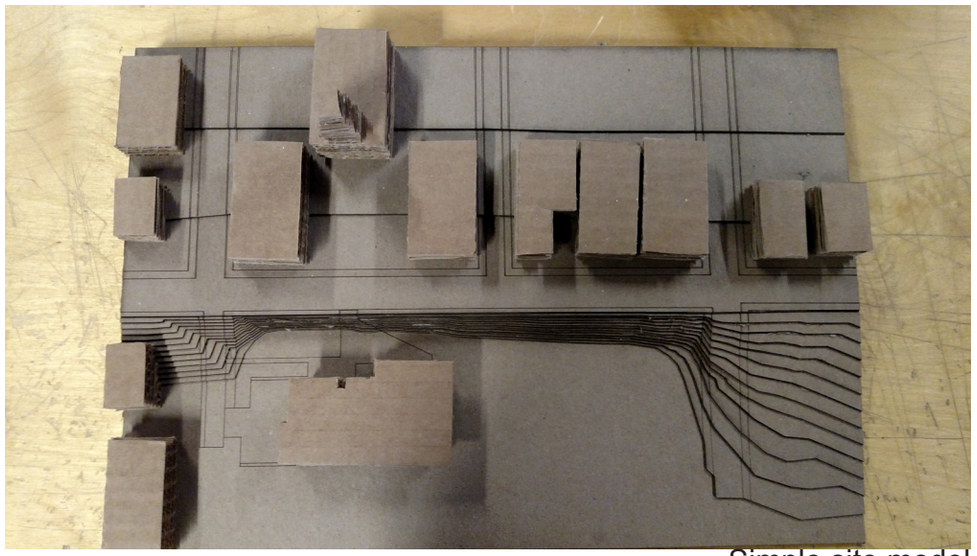



Park sketch, designing water feature





Simple building model



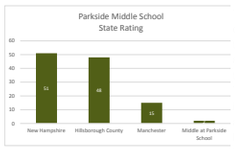
Simple site model

# Manchester Tutoring Center

## A Stimulating Learning Environment

Socrates said it best "Education is the kindling of a flame, not the filling of a vessel."(Meyerhoff) When stimulating the brain and its creativity in learning one needs to focus not on how to drive information in, but instead excite and inspire. The premise for this thesis is in focusing on the topic of space and how it can encourage creativity and advance a person in their learning pursuits. In doing this, one must look at different aspects of space such as acoustics, natural light, spatial organization, and the movement through the space.


The design of this thesis is a Tutoring Center set in Manchester, NH, a city with some of the lowest test scores in the state of New Hampshire. The main element of my design is the atrium space in the heart of the building that brings the students together and creates an environment of shared knowledge and techniques in learning. Students from grade K-8 with the different intelligences of linguistic, logical-mathematical, spatial, bodily-kinesthetic, musical, interpersonal, intrapersonal, naturalist should all find accommodations in this tutoring center to help them learn in their preferred manner.




Parkside Middle School and Gossler Park Elementary School have some of the lowest tests scores in the city of Manchester and are located in the neighborhood of my site.


The building is placed on an unused park in the east part of the city a couple blocks from the Merrimack River. The park is located well in the community, with a mix of single family housing and a large hospital boarding its site, but lacks interest to draw people into its space. So along with the Tutoring Center, the remaining site will be redesigned into a park more suitable for the neighborhood and Tutoring Center; giving the children, as well as families and those working in the nearby hospital, a place to both play and relax.

### Existing Site Photos

1

The existing park is filled with large trees on the north side of the site perfect for the new park. It also leaves an open site for the building placement.

2

The neighborhood is filled with single family homes, perfect for people to walk to the site.

3

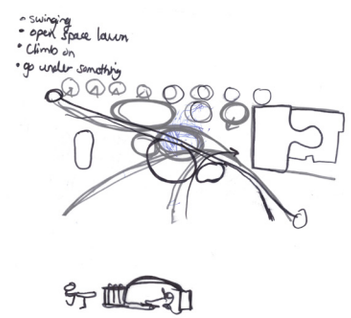
A main problem with the current park is the lack of interest in drawing people in. This light-post is the current parks center focus and personally I think it is lacking in appeal.

4

The catholic school across the street has a beautiful church connected with its site that serves as a viewpoint and icon for the neighborhood.

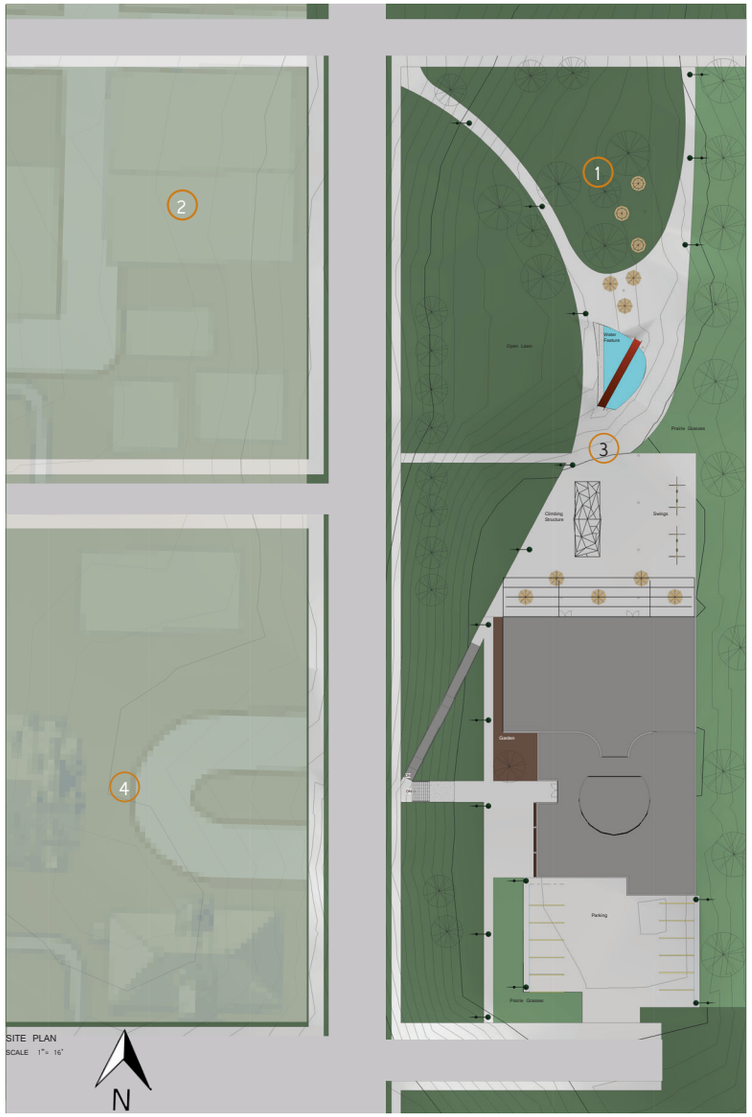
### Process Work

Socrates said it best
"Education is the kindling of a flame, not the filling of a vessel."




Process Park Sketch
Collaborated with Landscape Architect student, Jordan Gedrose


Studying Spatial Connections in Building



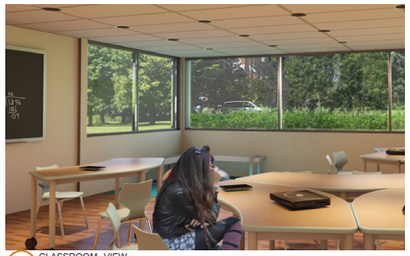

### Furniture

The Smith System Flavor Chair lets the student move side to side and backward. They can also sit on the chair forward, sidewards or backwards comfortably. Utilizing systems like this gives students better outlets for energy and enhances health.

The Smith System UXL Crescent Table is ideal for the tutoring center because it offers a wide range of options for students. They can work alone at the tables, or pair up at them. The table shape is also designed to be arrange into a group setting and along a curvy line for viewing purposes.

# Bottom Board

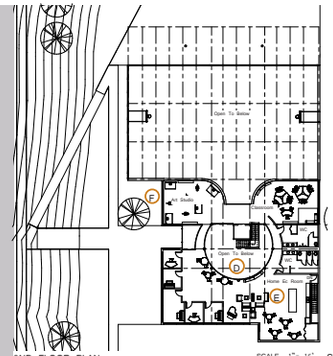
A ENTRANCE VIEW

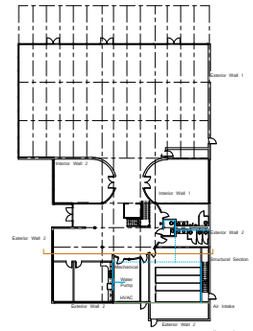


C CLASSROOM VIEW

E HOME EC/LOUNGE VIEW

F ART STUDIO VIEW



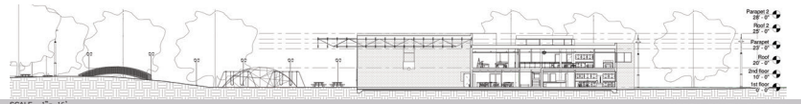

B ATRIUM VIEW

D 2ND FLOOR ATRIUM VIEW

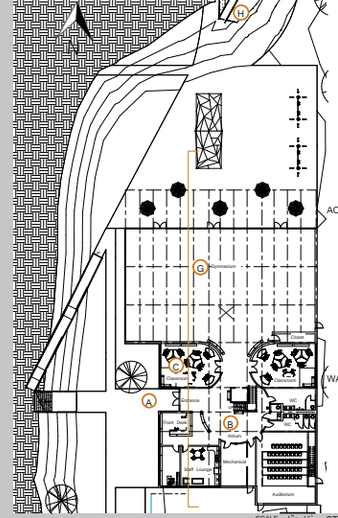
G GYMNASIUM VIEW

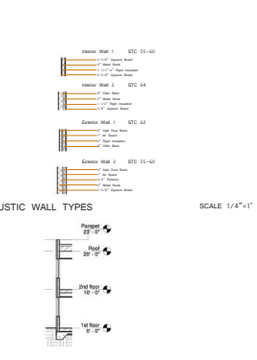
H PARK VIEW

FRONT ELEVATION -EAST




NORTH-SOUTH SECTION




Alicia Fadley A Stimulating Learning Environment ARCH 772 Design Thesis Mike Christenson
Revit Sketchup Photoshop Indesign

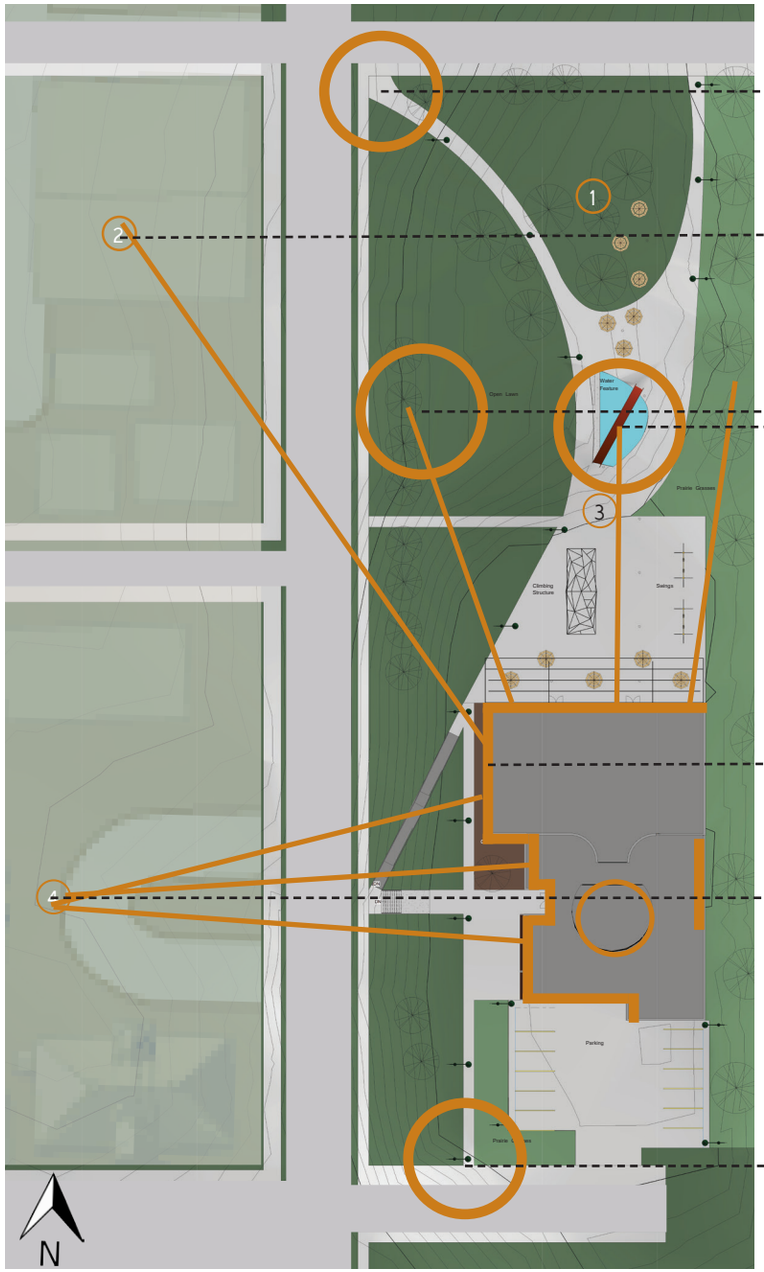
## Presentation Display




## Presentation Model

# RESPONSE TO SITE






Connecting walkways on site with existing pedestrian paths to encourage the flow of people into my site.

Creating views and connection to the residential houses nearby for encouraging community to engage in site, and give art students on 2nd floor of building a mix of views for different inspiration.

Preserving existing trees on site that are perfect for sun shading and that add to views from tutoring center.

New water feature that helps draw people into the site. It also acts a play ground for the children of the tutoring center.

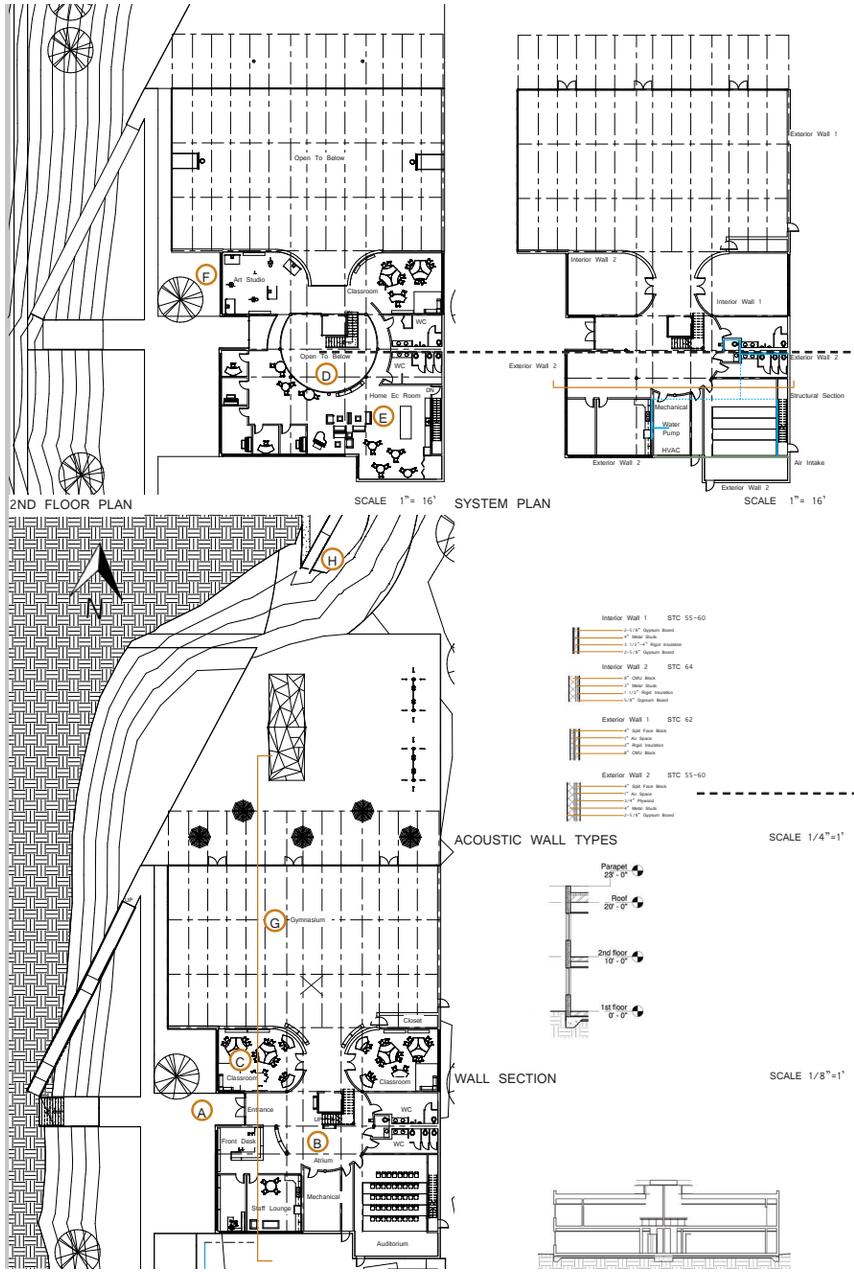
The orange line bordering some of the exterior walls of the tutoring center represents window or glazing placement in the building, creating views and daylight for the inhabitants.

The location of the brick church in the neighborhood that creates a great focus for views and connection between buildings.

Creating paths from the hospital on the south side of the tutoring center to the park is important to encourage the staff to take breaks from work

# RESPONSE TO RESEARCH






When researching organization of spaces in education facilities, a popular method that they feel is the best encouraging connection between students is having classrooms organized around a center community area. This allows a space for students to talk about topics inbetween different specific classrooms and allows them to mix ideas and methods. I created this atmosphere in my atrium space, where students move through the open lobby and stairs and can see or hear into some learning spaces and be influenced by different types of learning and different age groups as they all work together to tutor each other and learn.

I incorporated four different types of acoustics wall after researching how important having proper acoustics in different spaces is for students to focus and learn. If a student can hear what is being taught then they are already at a disadvantage to learning the material. Some spaces also require different levels of acoustics wall like, mechanical spaces need to keep the sound in, along with musical rooms, since the increase levels can dispute other spaces. Its also important to have auditorium rooms with high levels of acoustics barriers to keep sound out, as they need to focus on one person father away. Classroom as well need sound control to keep both sound in and out depending on how loud the students plan on being in an activity.

# RESPONSE TO GOALS



1. Academic Goals ----------
My academic goals for this thesis is that my research in space and learning will help to inform my design of a learning center. That I will graduate with a thorough knowledge of the basic of architecture and will be ready to enter the job field.

----------After completing the design of a tutoring center in Manchester, NH I found the research that I did fall to be very helpful in designing the connection of the spaces in building, making connections to natural views and daylight, and creating an environment with acoustics to help support the different activities.

2. Professional Goals ----------
Professionally, I hope my work on this thesis will open doors for me in work dealing with education. That it will prepare me for moving towards my license.

----------During my full time job this summer their will be a good chance of an opportunity for me to work on a renovation for a school in this region . With completing this thesis project I feel prepared to assist the architect on the project with this renovation and redesign of the spaces.

3. Personal Goals ----------
Personally, I am looking forward to learning more about the learning process. I have enjoyed teaching for the past 10 years, and an interested in advancing my abilities to create spaces that help me in my teaching.

----------After working on an education project and working as a teaching assistant for this past semester I am still interested in further researching education during my career and possibly teaching at a university.

# RESPONSE TO EMPHASIS



1. How the organization of the space effects the learning process? How can the furniture layout, size of room, movement in the room, etc, change how the student learns in that environment? ----------

Laying the spaces out inside a building can help stimulate conversation and connection between students and types of study which can lead to further learning.

2. How can natural light effect the learner? Can having to much light and outdoor views become a distraction, or can to little create the feeling of being imprisoned, stifling the creative spirit? ----------

Increasing daylighting to maximum amounts has shown to increase tests scores by 7-18%.

3. How can acoustics effect the space? What is the right level to hear the teacher from the front and to also accommodate group discussion within the room? Is the room used to special purposes such as music or drama? ----------

The building has four different types of acoustic walls that are each for different types of situations. Some rooms like the mechanical, classrooms, music rooms, gymnasium, and the auditorium need higher acoustic control with walls rated at 60 STC.

4. How can air flow, quality, and temperature effect the students? Can having cleaner air, in an environment that you are thermally comfortable in help you to focus better and feel better in the space? ----------

Having clean air can help students with asthma and prevent further sickness. It can also help prevent headaches from chemical odors.

# THESIS APPENDIX

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# Previous Experience

| Year: | Professor: | Project: |
|---|---|---|
| Fall 2012 | D. Booker | Tea House<br>Boathouse |

•Started to learn about the design process and drawing inspiration.

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|---|---|---|
| Spring 2013 | R. Fiskness | Dance Studio<br>Sensory Pavilion<br>Culinary Arts School |

•Learned the basics of code and a building programing.

| | | |
|---|---|---|
| Fall 2013 | P. Gleye | Dairy Queen Redesign<br>Fitness Center<br>Street-scape |

•Learned about urban city design and zoning, focus on wood and masonry construction.

| | | |
|---|---|---|
| Spring 2014 | B. Aly Ahmed | Culinary Arts Center<br>Border Crossing |

•Focus on steel and concrete construction.

| | | |
|---|---|---|
| Fall 2014 | D. Faulkner | High Rise<br>“100” Project |

•Designed a high rise building in San Francisco.

| | | |
|---|---|---|
| Spring 2015 | P. Gleye | Brussels Concrete<br>Plant Redesign |

•Learned about European design while redesigning a concrete site.

| | | |
|---|---|---|
| Fall 2015 | G. Mahalingam | IEQ Education<br>Research |

•Learned how to set up a research experiment and gained knowledge in new subjects.



# Personal Identification

I am a Graduate Student at NDSU working on my Masters of Architecture. For fun I enjoy being outdoors, painting, and leading bible studies. I have moved fourteen times, living all over the United States and have loved every place. Architecture has been my passion since I was sixteen and I fall in love with it more every day.

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